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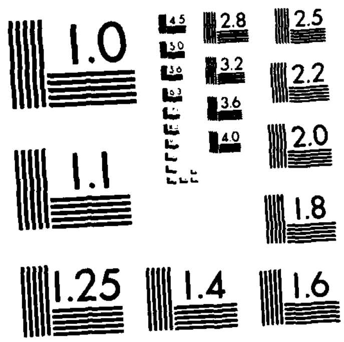
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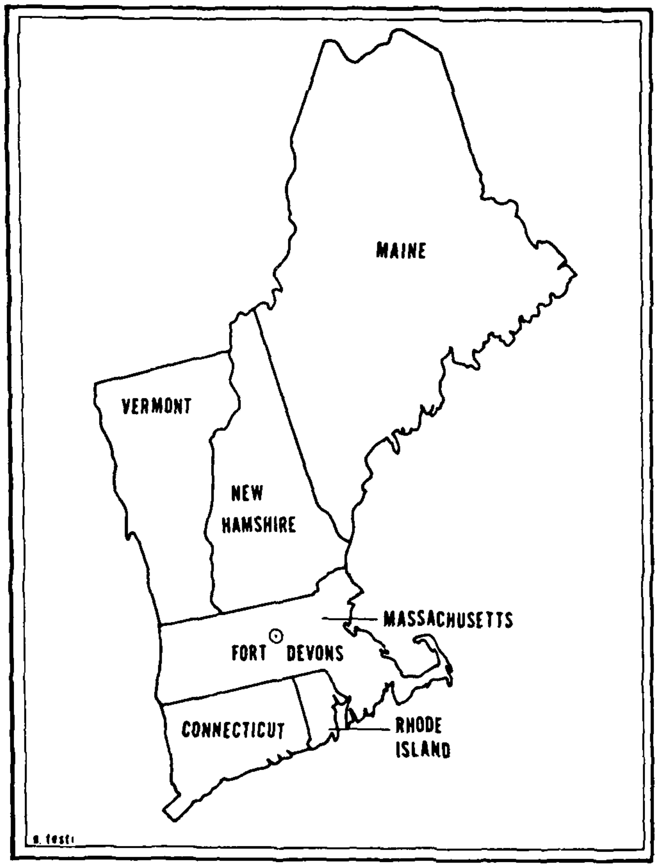
AN ARCHEOLOGICAL SURVEY AT FORT DEVENS, MASSACHUSETTS AND ITS OFF-BASE FACILITIES

(C -5891[79])

AD-A134 734



John Hammer,
Principal Investigator

For

United States Army
Ft. Devens, Massachusetts

May 1983

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No.

4. Title and Subtitle	5. Report Date
An Archaeological Survey at Fort Devens, Massachusetts, and its Off-Base Facilities	August 1983
	6.
7. Author(s) John Hammer, with contributions by Dan Dimicco, Lisa Fagan and Robert Wallace	8. Performing Organization Rept. No. 012
9. Performing Organization Name and Address John Hammer 52 South Allen Street Albany, N.Y. 12208	10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) 5891 (79) (G)
12. Sponsoring Organization Name and Address U.S. Army Fort Devens, Massachusetts	13. Type of Report & Period Covered FINAL August 1983 14.

15. Supplementary Notes
Administered by
Inter-Agency Archaeological Service, National Park Service

16. Abstract (Limit: 200 words)

A cultural research survey was conducted at Fort Devens Military Reservation, Massachusetts and 67 offbase support facilities in the five New England States, most of them in Connecticut and Massachusetts. The data gathered was used to test two preliminary models of site prediction based on environmental data. The majority of the areas surveyed exhibited extensive disturbance due to prior land use and modification. No prehistoric cultural materials which would limit the potential use of the areas surveyed were found in any of the areas surveyed.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms

Cultural Resources Survey	Archaeology	Nashua River
New England	Geology	
Ft. Devens, Mass.	Palynology	

c. COSATI Field/Group

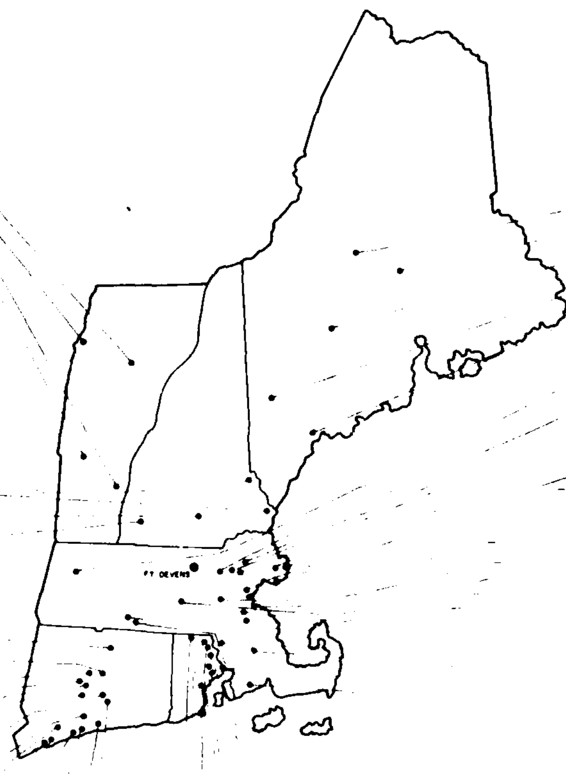
18. Availability Statement	19. Security Class (This Report) Unclassified	21. No. of Pages 273
	20. Security Class (This Page) Unclassified	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

OFF - POST FACILITIES

KEY

R	RESERVE CENTER
A	AREA MAINTENANCE SHOP
F	FAMILY HOUSING
TNG	TRAINING SITE
69	FACILITY NUMBER



VERMONT

MONTPELIER 40	R			
WINOOSKI 42	R			
CHESTER 43	R			
RUTLAND 41	R	A		

NEW HAMPSHIRE

ROCHESTER 31	R			
PORTSMOUTH 30	R			
MANCHESTER 29	R	A		
GRENIER FIELD 28	R	A		

CONNECTICUT

EAST WINDSOR 55,56	2-R	A	F	
MANCHESTER 46			F	
WEST HARTFORD 61	R			
PLAINVILLE 59			F	
NEW BRITAIN 54			F	
WATERBURY 64	R			
CROMWELL 58	R			
ANSONIA 47,48	R		F	
SHELTON 53			F	
WESTPORT 52			F	
FAIRFIELD 51,60	R		F	
MILFORD 45,50	R	A	F	
ORANGE 49			F	
NEW HAVEN 63	R			
MIDDLETOWN 44,57,62	R		F	

MAINE

DEXTER 68	R			
BANGOR 67	R			
AUBURN 65	R	A		
BRIDGTON 66	R			
SACO 69	R			

MASSACHUSETTS

PITTSFIELD 22	R			
BEDFORD 11	R		F	
TOPSFIELD 25			F	
BURLINGTON 3			F	
WAKEFIELD 5			F	
DANVERS 6	R			
NORTH BEVERLY 7			F	
BOSTON 2,9	R	A		
NAHANT 4			F	
HULL 8			F	
ROSLINDALE 23	R			
HINGHAM 15	R	A		
WORCESTER 27	R			
RANDOLPH 10			F	
BROCKTON 18,20	2-R	A		
SPRINGFIELD 24	R			
ATTLEBORO 17	R			
TAUNTON 12	R			
GRANBY 19				TNG
SWANSEA 14			F	
NEW BEDFORD-FT RODMAN 16	R	A		

RHODE ISLAND

CRANSTON 13	R			
BRISTOL 34	R			
WARWICK 37	R			
PROVIDENCE 36	2-R			
DAVISVILLE 32			F	
FORT GREENE 35	R			
LINCOLN 33		A		
NORTH SMITHFIELD 38			F	

AMENDED 18 DEC 1978

AN ARCHAEOLOGICAL SURVEY

AT

FORT DEVENS, MASSACHUSETTS

AND ITS

OFF-BASE FACILITIES

(C-5891 [79])

Prepared for: United States Army, Ft. Devens, Massachusetts

Submitted to: Interagency Archeological Services
National Park Service
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Atlanta, Georgia 30303

Author: John Hammer, Principal Investigator

Date: November 1979
Revised: April 1980
Final Submission: May 1983

TABLE OF CONTENTS

LIST OF PLATES

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENT

The author would like to thank Dan DiMicco for writing Chapter 4, Lisa Fagan for writing Chapter 3 and Bob Wallace for writing Chapter 2. I would also like to extend our thanks and appreciation to the Real Property Office at Fort Devens, especially Bob Winters. I would also like to thank the persons working in the six SHPOs that were either visited or contacted by phone. Special thanks goes to the field crew which suffered hard work, poison ivy, motel food and constant travel. Last of all I would like to thank Ed Hession of the Inter Agency Archaeological Service for his unlimited patience and his expert editorial advice.

ABSTRACT

A cultural research survey was conducted at Fort Devens Military Reservation, Massachusetts and 67 offbase support facilities in the five New England States, most of them in Connecticut and Massachusetts. The data gathered was used to test two preliminary models of site prediction based on environmental data. The majority of the areas surveyed exhibited extensive disturbance due to prior land use and modification. No prehistoric cultural materials which would limit the potential use of the areas surveyed were found in any of the areas surveyed.

MANAGEMENT SUMMARY

This report presents the result of a cultural resources survey conducted at Fort Devens, Massachusetts and 67 off-base support facilities in the five New England states. The project was performed on behalf of the U.S. Army, Fort Devens, Massachusetts during the spring and summer of 1978, under the administration of the Inter Agency Archaeological Service, National Park Service in fulfillment of Contract Number C-58971(79).

Research was conducted in three stages, each representing a sequential level of investigation. Stage I included a comprehensive literature and document search for historic and prehistoric sites on and near each facility, exploratory visits to each facility and preparation of narratives dealing with geology, culture history and ecology of the project area. On this basis, each facility was evaluated for further investigation needs. The evaluation criteria are discussed in detail in Chapter 5.

Stage II consisted of surface and subsurface investigations of those facilities which were flagged for further research during Stage I, while Stage III consisted of analyses which included an empirical test of two site locational models for the project area.

The only evidence of prehistoric activity was the recovery of one unmodified flake on the surface of the driveway of building T-90 at the Hingham facility. The only historical remains came from area L2 at Fort Devens. A concrete sluice gate and fieldstone and brick foundation of undetermined age were discovered there.

One reason for the lack of cultural material is the fact that the amount of disturbance that was encountered was much greater than anticipated. Much of Fort Devens has undergone intensive surface modification and land use during its many years of existence and still is under heavy use and modification. Specific types of disturbance include built-up areas, landscaping, sand mining and artillery, small arms and tracked-vehicle ranges. It was found that many areas that seemed only superficially disturbed turned out to be very deeply disturbed.

The results of this survey indicated few potentially significant cultural remains. Recommendations for further investigation at this level are limited to locating, dating and documenting historic properties in area L at Fort Devens. No other areas need further testing and any use or modification of such areas will not impact significant resources.

Table 1 is a summary of action taken at each facility.

Facility	Level of Investigation	Cultural Resources	Recommend Further Investigation
1A	Stage II	None	No
1B	Stage II	None	No
1C	Stage II	None	No
1D	Stage II	None	No
1E	Stage II	None	No
1F	Stage II	None	No
1G	Stage II	None	No
1H	Stage II	None	No
1I	Stage II	None	No
1J	Stage II	None	No
1K	Stage II	None	No
1L	Stage II	Historic	Yes
2	Stage I	None	No
3	Stage I	None	No
4	Stage I	None	No
5	Stage I	None	No
6	Stage II	None	No
7	Stage I	None	No
8	Stage I	None	No
9	Stage I	None	No
10	Stage I	None	No
11	Stage II	None	No
12	Stage II	None	No
13	Stage I	None	No
14	Stage I	None	No
15	Stage II	Prehistoric	No
16	Stage I	None	No
17	Stage I	None	No
18	Stage II	None	No
19	Stage II	None	No
20	Stage I	None	No
22	Stage II	None	No
23	Stage I	None	No
24	Stage II	None	No
25	Stage II	None	No
27	Stage I	None	No
28	Stage I	None	No
29	Stage II	None	No
30	Stage I	None	No
31	Stage I	None	No
32	Stage I	None	No
33	Stage I	None	No
34	Stage I	None	No
35	Stage I	None	Stage II
36	Stage I	None	No
37	Stage II	None	No
38	Stage I	None	No
40	Stage II	None	No
41	Stage I	None	No
42	Stage I	None	No
43	Stage I	None	No
44	Stage II	None	No
45	Stage I	None	No
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48	Stage I	None	No
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61	Stage I	None	No
62	Stage I	None	No
63	Stage II	None	No
64	Stage II	None	No
65	Stage I	None	No
66	Stage II	20th Century	No
67	Stage I	None	No
68	Stage II	None	No
69	Stage I	None	No

TABLE 1
Facility by Facility Management Review

CHAPTER I

INTRODUCTION

This report presents the result of a cultural resources survey conducted at Fort Devens, Massachusetts and 67 off-base support facilities in the five New England states. The project was performed on behalf of the U.S. Army, Fort Devens, Massachusetts during the spring and summer of 1978, under the administration of the Inter Agency Archaeological Services, National Park Service in fulfillment of Contract Number C-58971 (79). The survey was conducted in compliance with the National Historic Preservation Act of 1966 (Public Law 89-665), National Environmental Policy Act of 1969 (Public Law 91-190), Executive Order 11593, and the Advisory Council's Procedures for the Protection of Historic and Cultural Properties (36 CFR 800).

The project area is comprised of Fort Devens in Central Massachusetts and 67 off-base facilities scattered throughout Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire and Maine (for a detailed list see Appendix II). Approximately half of the facilities are located in urban settings. Although Fort Devens, by far the largest of the facilities, is situated in a rural setting, it is densely populated and has undergone intensive surface modification and land use. The project area is shown on Figure I-1.

Research was conducted in three stages, each stage representing a sequential level of investigation. Stage I included: a comprehensive literature and document search for historic and prehistoric sites within a two mile radius of each facility, exploratory visits to each facility and preparation of a narrative dealing with the geology, cultural history and ecology of the project area. On this basis each facility was evaluated to either schedule it for further investigation or not. The evaluation criteria are discussed in detail in Chapter 5.

Stage II consisted of surface and subsurface investigation of those facilities which were flagged for further investigation during Stage I. Stage III consisted of analysis. This included an empirical test of two site location models for the project area (discussed in Chapter 5) and recommendations.

It has long been assumed that the primary variables used in making site location decisions were associated with the distribution of resources and topographic features which allow minimum effort for exploiting these resources (Hardesty 1977, Ritchie 1969A, Ritchie and Funk 1973). Elaborate models which explain and predict site location/resource distribution relationships have been created and tested (Brose 1976, Ritchie and Funk 1973, Thomas 1973, Versaggi and Ewing 1979). Our approach was based on examining the relationships between

environmental characteristics and inferred prehistoric subsistance and settlement patterns. Research procedures involved a two-tiered system of evaluative models: zonal and locus specific. Although the two models appear superficially similar the underlying methods are quite distinct. The theoretical approach was inductive in that the variables selected for analysis were based on a review of existing ecological and archaeological data.

The zonal model provides an assessment of the relative prehistoric site sensitivity of a zone. Each zone was given a score dependent on the type and number of desirable topographic and environmental features present. The resulting score is an indicator of the relative cultural resources potential of the zone. This measure, the Zonal Environmental Score, or ZES, is additive in that the final score is a sum of the type and amount of desirable features in the zone. The higher the resultant score the higher the cultural resource of the zone. The zonal model predicts the sensitivity of an area and therefore is not as powerful when dealing with specific locations. The variables chosen to convey this information are discussed in Chapter 5.

The locus-specific model is based on a different scale. Certain environmental and topographic variables were coded for each known site within an area. With that data it is possible to compute a measure of central tendency for each of the variables. Since the data are ordinal, the medians for each variable describe the typical site location. Specific loci, such as *facilities*, were also coded as described above. The amount of agreement between the median values and those of a specific locus for each variable can be interpreted as a relative measure of the sensitivity of that locus - this measure is the Cumulative Distance Score, or CDS. The locus-specific model differs in that it is normative. The most common or average location parameters are used to describe the qualitative distances between any one locus and the ideal or median for all known sites. The smaller that distance, the higher the cultural resource potential of that locus. The locus-specific model deals with the resource potential of a specific locus and cannot be extended to environmentally heterogeneous zones.

This report is organized into three general sections. The first, including chapters 1 through 4, is a contextual section containing information on geology, ecology and culture history. The second is a methodology section which includes chapters 5 and 6 and provides information on research design and strategy. The last section, including chapters 7 and 8, is concerned with analysis, conclusions and cultural resource management recommendations.

CHAPTER 2

GEOLOGIC HISTORY

Glacial History

The surface geology and topography of New England is dominated by the effects of post glacial activity. The details of the Pleistocene and post - Pleistocene history of New England are still poorly known although the area has been intensively studied since the first acceptance of Louis Agassiz's "Glacial Theory" by Timothy Conrad in 1839. The reasons for this lack of detailed understanding include the fact that the glacial drift is relatively thin and comprised of high proportions of boulders. This creates a sediment that is difficult to correlate with other regions. The average thickness of the drift has been estimated as less than 10 meters, with 5 meters as a typical thickness (Schafer and Hartshorn 1965). In Connecticut drift thickness ranges from 1.5 to 3 meters (Flint 1933) while in New Hampshire it averages 3 to 5 meters (Goldthwait and Kruger 1938).

Another problem is that the glacial till is relatively non-calcareous which means that comparative depths of leaching cannot be used as a means for determining the relative ages of tills. The low occurrence of end moraines suggests that the retreat of the glaciers from the region was the result of stagnation and melting of the ice rather than a regional retreat of an extensive ice front as is characteristic of the glacial record in the Midwest (Thornbury 1965). Local retreats and readvances have been recognized in some areas and this has had an important influence on the sedimentary record and the drainage history of New England.

In general, the glaciers were more effective as depositional agents than as erosive agents. The most widespread effect of glaciation was a general smoothing of the bedrock topography and the filling in of preglacial river valleys. The dominant sediment deposited by the ice was an unsorted sand and gravel known as till. The tills in New England may be characterized into two types depending upon the source rock. Grey tills are the result of mafic materials present in the source rocks. The other type of tills are represented by various other colors such as red, for tills derived from the red Triassic or Pennsylvanian sedimentary rocks; black for tills derived from Pennsylvanian phyllites; nearly white for tills derived from granite; and rusty for tills derived from pyritic schists (Schafer and Hartshorn 1965). Most of the tills are dominated by sand and some coarser particles. Clay content is generally less than 10%.

On a regional level there is little evidence for preglacial lakes. Most of the present lake basins were caused by the unequal thickness of

the drift in preglacial valleys. Thousands of these basins held lakes and ponds when the ice retreated. Many of these have since become swamps or meadows (Fenneman 1938). Most streams remained in their old valleys, although they usually left the original channels. As these streams established new channels on the drift surface they frequently cut down to bedrock resulting in the development of falls and rapids that are characteristic of the region today.

A high proportion of the drift is water-lain rather than till. These sorted sands and gravels and varved clays partially fill all but the smallest river valleys. Some deposits are due to the unobstructed flow of the melt water (valley trains) while others are due to waters that had been locally and partially dammed by remnants of glacial ice forming sluggish streams or lakes.

Physiographic Regions of New England

New England may be divided into a number of physiographic regions. These regions include the Taconic Section, the Green Mountains, the White Mountain Section, the Lake Champlian Lowlands, the New England Uplands, the Connecticut Lowlands and the Coastal Lowland (Fenneman 1938; see Figure II-1).

The Taconic Section

This section is located on the western side of the New England province. It consists of generally low mountains developed upon Cambrian and Ordovician slates, schists and phyllites. Carbonate rocks such as limestones and marbles underlie the valleys (Doll 1970; Fenneman 1938; Thornbury 1965). The elevations of the mountainous areas tend to be less than 700 meters above sea level.

Many of the larger valleys have been modified by glacial effects. The valley of the northflowing Hoosic River was flooded in postglacial times by glacial lake clays and deltaic sands. This general pattern is characteristic of other northflowing streams in the region. However, southflowing streams, such as the Housatonic River, were able to drain more easily. Their sediment is dominated by river sands but there are very few features due to ponding (Taylor 1903).

The Green Mountains.

The Green Mountains are located north of the Taconic section. They are the result of a large anticlinorium that has been eroded to expose a core of crystalline Precambrian rocks that are overlain by Paleozoic metamorphic rocks (Doll 1970; Fenneman 1938; Thornbury 1965). Maximum elevations are above 1200 meters but the prevalent altitude is not much above 900 meters.

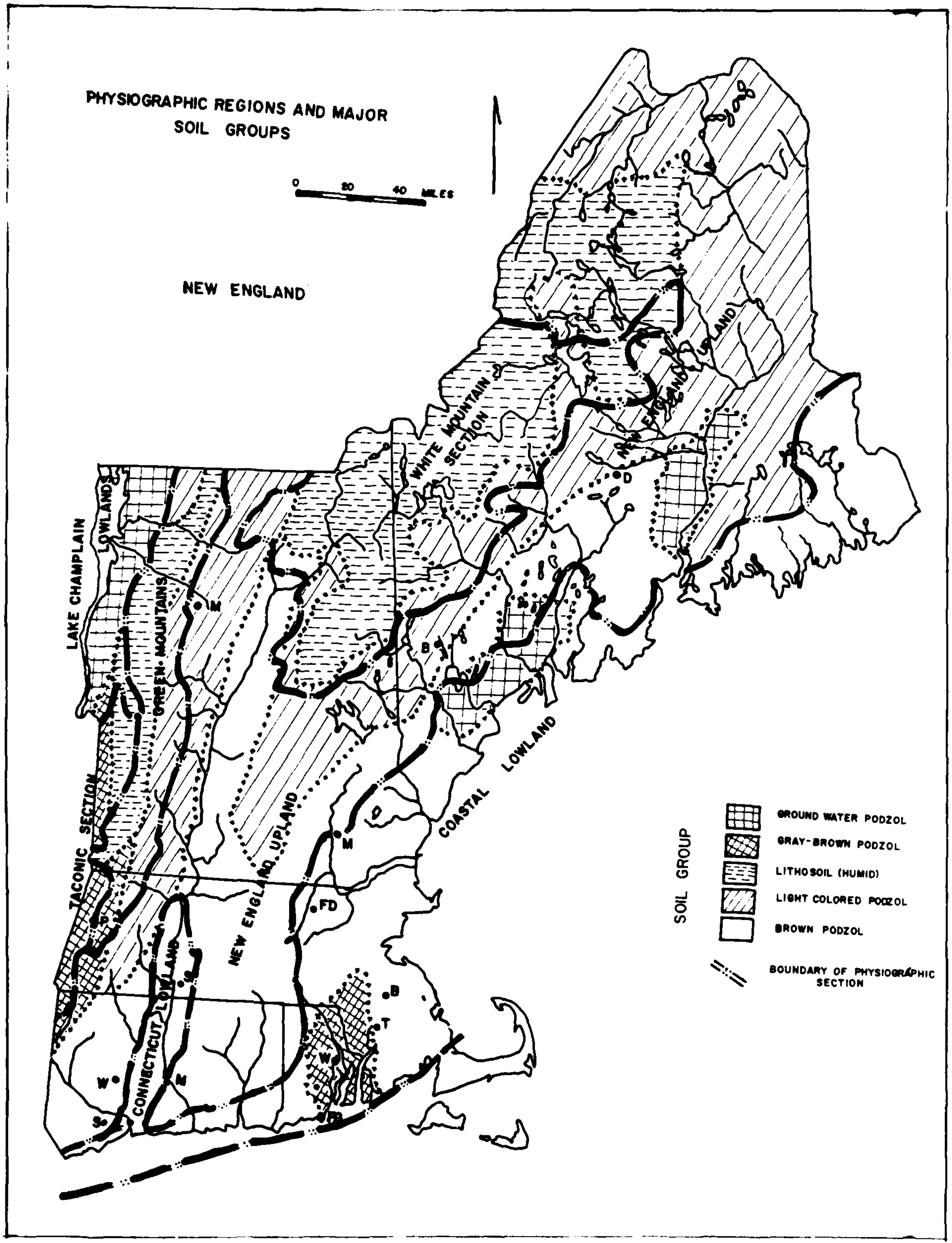
PHYSIOGRAPHIC REGIONS AND MAJOR SOIL GROUPS
0 20 40 MILES
NEW ENGLAND
LAKE CHAMPLAIN LOWLANDS
GREEN MOUNTAINS
TACONIC SECTION
CONNECTICUT LOWLAND
NEW ENGLAND UPLAND
WHITE MOUNTAIN SECTION
COASTAL LOWLAND
SOIL GROUP
GROUND WATER PODZOL
GRAY-BROWN PODZOL
LITHOSOIL (HUMID)
LIGHT COLORED PODZOL
BROWN PODZOL
BOUNDARY OF PHYSIOGRAPHIC SECTION

Figure II-1

The White Mountain Section

This section is located on the northern portion of the province. These mountains rise well above the level of the adjacent New England Upland. They are the result of granitic intrusions that crop out in an area 50 kilometers long and 40 kilometers wide. The drainage is radial from the center of the section. Water and ice seem to be the predominant factors influencing the nature of the topography. Although there is evidence that these mountains were covered by the ice sheet that affected all of New England, there is also evidence, in the form of cirques, that alpine glaciation affected the terrain as well. The elevations of the highest peaks are over 1500 meters with Mount Washington in New Hampshire at 1920 meters and Mount Katahdin in central Maine at 1600 meters above sea level (Fenneman 1938; Rais 1939; Thornbury 1965).

The Lake Champlain Lowland

This is a region of relatively low relief located in the northwest portion of the province. The low relief is due to relatively soft Paleozoic sediments. Glaciers probably also helped to reduce the topography. As the late stages of ice withdrew from this lowland, an extensive lake developed. This lake has been called Lake Vermont by Chapman (1937). Three additional stages of this lake have been recognized. The Coveville and Fort Ann stages were invasions of marine waters from the St. Lawrence Lowland to the north. A final subsiding marine stage was known as the Champlain Sea, which existed just prior to 10,000 B.P. (Flint 1971).

The New England Upland

The New England Upland section is the largest section in the province. It is an area of complex geology that has been extensively dissected by rivers and glaciers. Its general altitude varies from a little over 150 meters at its seaward margin to approximately 370 meters inland. Typical topography is gently rolling hills with occasional higher peaks, some with elevations as high as 900 meters. These peaks are known as monadnocks. These monadnocks increase in number toward the White Mountain Section (Lobeck 1937; Raisz 1939). The depths of the river valleys vary with the altitude. It is common for streams in the middle of their courses to have valleys that are cut from one third to one half the distance to sea level. In northern Vermont and central New Hampshire the upland is less of a plain and more rugged. In northern Maine it is primarily rolling hills with many lakes and considerable swampland.

The effect of the glaciers on the surface geology of the New England Upland may be illustrated using the Fort Devens, Massachusetts area as an example. As the ice retreated from this area, a glacial lake, Lake Nashua, was formed in the preglacial river valley of the Nashua River. As Lake Nashua became larger with the northward recession of the ice sheet in the Nashua Valley, its water level dropped to successively lower

stands as lower outlets for the water were uncovered to the north and eastern margin. Some of these lake levels were preserved. During this time the lake drained to the east and to the south. Later the Ayer outlet was abandoned for one to the north. During the last stages of the lake it was divided into several distinct bodies connected by small streams. As these small lakes drained, they formed the river channel for the Nashua River which continues this northward course. Thus, as is common in other parts of the upland, the landscape has been relatively modified by the postglacial ravine cutting, slope wash and slumping (Jahns 1953).

The resultant stratigraphy in this area is as follows: The oldest sediments are glacial till deposited upon the bedrock in the area. Two tills have been recognized. The older till is approximately 15-18 meters thick. It is a compacted, dark sand and gravel. The younger of the two tills is thinner, only about 2.5 meters thick with a maximum of 6 meters. It is a bouldery, loose and poorly compacted unit with occasional lenses of water-lain sand, silt and gravel. Directly above these ice deposits are the water-lain deposits associated with Lake Nashua. These sediments include varved clays and sands that represent bottom sediments of the lake. The topset beds of the delta-outwash plains are represented by horizontal bedded gravel and sand while the foreset beds are represented by inclined finer sediments. Elongated sand and gravel deposits indicate ice channel fillings and kame deposits. The youngest sediments are Holocene deposits which include muck and peat in the swamps that have formed in the old lake bed, silt and sand that have formed in the river terraces, and buff to brown silt and fine sand that form dunes of eolian origin (Jahns 1953).

The Connecticut Lowland

This is a relatively small section in the southern portion of the New England Province. It is structurally down-faulted lowland underlain by Triassic arkosic sandstones, conglomerates and shales. In addition, there are intrusive and extrusive basaltic igneous rocks. Although most of the area has low relief, the igneous units typically form ridges wherever they crop out (Fenneman 1938; Thornbury 1965).

The Connecticut River flows in this lowland until it reaches Middletown, Connecticut, where the river leaves the lowland and turns southeastward to cross the upland in a narrow valley. As the glacial ice receded from this region the lowland north of Middletown became a lake (Emerson 1897; Flint 1933; Jahns and Willard 1942). The deposits in the Connecticut Valley consist of three categories: a) terraces composed of fluvial sands with lesser amounts of lacustrine clays; b) laminated or varved clay, silt and minor amounts of sand deposited in a lake; c) post-lake deposits including fluvial deposits of gravel, sand and silt with some eolian deposits of sand and loess. Flint (1933) felt that the various clays represent different lakes while Jahns and Willard (1942) felt that they represent the remnants of a larger continuous lake. As the ice continued to retreat, river deposits were superimposed on top of

the lake sediments. Eventually the Connecticut River reestablished itself and dissected the earlier sediments. The final draining of the south end of the lake occurred approximately 10,710-10,650 years B.P.

The Coastal Lowland

This is a strip of land along the east coast that is geologically similar to the adjacent New England Upland but has a lower relief. The differences in topography may often be explained in terms of the relative hardness of the underlying rock units. In general, the carboniferous sediments weather more easily than the other more metamorphosed units. Hence, in areas such as the Boston basin and the Narragansett basin in Rhode Island, the lower topography is probably due to the underlying Carboniferous sediments. Deep preglacial valleys have formed in these basins. These valleys now contain very thick drift deposits.

In portions of Maine there is evidence for a marine transgression. The Penobscot Formation records this event (Bloom 1960). This formation contains a marine fauna and attains a maximum thickness of 30 meters although it is commonly less than 6 meters thick. This marine transgression occurred approximately 11,800 years B.P. Barrell (1920) has argued that terraces in Massachusetts and Connecticut are also due to marine advances during glacial minima.

Fluctuations in Sea Level

It has been demonstrated that sea level has fluctuated during glacial advances and retreats. Calculations based upon the estimated volume of ice that probably existed and the amount of isostatic adjustment that was likely to have occurred suggest that a difference of approximately 100 meters could have existed between today's sea level and that of a glacial age. It has also been estimated, but harder to verify, that sea level might have at times been as much as 65 meters above present sea level (Milliman and Emery 1968).

Stratigraphy-Pollen

The study of pollen and spores has been used for the reconstruction of the environments in which former plants lived and for correlation of pollen-stratigraphic zones from place to place. By plotting the abundance of pollen from various depths in a core it is possible to determine the nature of floral change in a particular area. If these depths can be converted to geologic time, then pollen abundances in a core may provide a convenient estimate of the age of a particular sediment. In general, the region was dominated by tundra vegetation from 12,000 to 15,000 years B.P., tundra-woodland from 9000 to 12,000 years B.P., mixed forest from 7000 to 9000 years B.P. and deciduous forest from 7000 years B.P. to the present (Ogden 1965).

Soils

Soils are the result of the interactions among the surface geology, which in New England is predominantly glacial drift, the vegetation, and water. Thus soil zones can provide information about more recent environmental processes. In general the soils in mountainous areas are thinner than those in lowlands. The soils in New England are classified as podzols (Butzer, 1971). The essential portion of a podzol soil is the presence of a bleached zone (the A_{2e} beneath the surface litter). Although podzols, or spodosols, (Hausenbuiller 1978) occur under varying conditions they are most common in spruce-fir woodlands. Other species of trees, both coniferous and deciduous, are capable of producing this type of soil. Strong acids are commonly produced by the decay of the litter. These strong acids rapidly decompose the nonquartz minerals including clays, iron oxides (Fe_2O_3) and aluminum oxides (Al_2O_3) resulting in the formation of a whitish A_2 horizon immediately beneath the leaf litter (A_{00} and A_0). The iron and aluminum in combination with soluble organic matter from the A_0 horizon move through the A_2 and are deposited in the B_2 horizon.

The varieties of podzols that have been recognized in the New England area include the following:

Ground Water Podzol. These are gray, sandy soils with brown cemented, sandy, subsoils developed under forests from nearly level, imperfectly drained sand in humid regions. Variations of this type include dark brown to black soils developed with poor drainage under grasses (called Wiesenboden) and poorly drained, shallow, dark, peaty or mucky soils underlain by gray mineral soil under a swamp-forest (called Half-bog soils) (Allen 1959). Ground water podzols are regionally distributed on the poorly drained marine sands and clays of coastal Maine and on the former glacial lake beds such as in the Lake Champlain Lowlands.

Gray-brown Podzol. These are grayish-brown leached soils of temperate, humid forested regions. These soils are best developed in the Taconic section and on portions of the coastal lowland.

Lithosoil. These are shallow soils consisting largely of an imperfectly weathered mass of rock fragments, largely but not exclusively on steep slopes. They are most common in the highest, most mountainous regions such as the Green Mountains and the White Mountain section.

Light Colored Podzol. These are light-colored leached soils of cool, humid forested regions. These soils develop on somewhat dryer terrain than the brown podzol. They are predominently in the New England Upland and represent a transition between the mountain soils and the more lowland brown podzols.

Brown Podzol. These are brown leached soils of cool temperate, humid forested regions. They are predominently formed in the lower areas of the New England Upland and along the Coastal Lowland (Allen 1959).

CHAPTER 3

ECOLOGICAL RECONSTRUCTION[1]

Introduction

This chapter was prepared to provide a contextual narrative and to present a reconstruction of the regional vegetational sequence for the project area. This vegetational reconstruction has been derived from the many pollen diagrams which have been compiled and interpreted over the past years. Present day vegetational types are also described. For the purposes of this report, southern New England will include Connecticut, Rhode Island, Massachusetts, southern Vermont, and southern New Hampshire. Northern New England will include northern Vermont, northern New Hampshire and Maine.

Pollen cores are obtained from lakes, ponds or bogs and the successive layers of sediments are examined for the amount and type of pollen present. Variations in the types and amounts of pollen over the period of time during which the sediment was deposited is tabulated (West 1964:48) and pollen zones delineated. Therefore, pollen zones can be considered as stratigraphic and chronological units depicting vegetational changes.

Until recently a major assumption in palynological research has been that only climatic changes were responsible for the changing vegetational composition of an area as indicated by the pollen profiles, and therefore a total picture of a past environment could be obtained. This however, is not possible. Palynologists have based climatic inferences on the distribution of a few specific genera of arboreal species. These vegetational and climatic associations were not based on specific climatological data, but on the assumption that factors governing present vegetational distributions are the same factors that governed past vegetational distributions. This is not necessarily an accurate assumption since vegetational distributions have been relatively stable since 7000 B.P., but previous to 7000 B.P., New England underwent several drastic vegetational changes which were influenced by many factors other than climate. These other factors affecting vegetational distributions include edaphic limitations, topography, radiation, methods and speed of seed dispersal into new areas, and sea levels (Butzer 1971;

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[1]The following section, except for the introduction, was prepared by Lisa Fagan. Portions of this section have been excerpted from an article written by Ms. Fagan, (1978) "A Vegetational and Cultural Sequence for Southern New England, 15,000 BP to 7,000 BP" Man in the Northeast. 15-16: 70-92 and appear with her permission.

Davis 1967; Wendland and Bryson 1974:9). It is possible to compile a vegetational sequence for New England by interpreting the available pollen diagrams, but it must be kept in mind that specific statements concerning the rest of the past environmental setting cannot be made.

By knowing the vegetational makeup of an area at a certain time it is possible to determine if the area was habitable by human groups. An important factor in determining if an area is favorable for human utilization is the availability of food resources. Many factors are related in producing an adequate food supply, but the vegetation appears to be one of the most important factors. The vegetation not only provides a direct food source for humans, but it also is a food source for fauna which, in turn, are utilized as a food source for human groups. Therefore, the pollen profiles can be specifically utilized to reconstruct the past vegetation to determine the presence and composition of favorable habitats for human occupation.

Several pollen profiles from southern and northern New England have been examined and interpreted. These profiles have been collected over the past forty years and due to different methods and techniques of collection and analysis, the results from all the profiles are not entirely compatible. The R factor, which partially compensates for differential pollen production and preservation (Davis 1963), was not applied to most of the diagrams since this method was developed in 1963 and the majority of the profiles were obtained between 1939 and the early 1960s. Several of the palynologists working in New England mentioned the overproduction of pollen by such genera as Pinus and Abus (David 1958; Deevey 1939), but had nothing to compensate for it in their diagrams.

Another major difference between the earlier and more recent pollen profiles is that the earlier ones did not identify or count nonarboreal pollen (NAP) and the more recent ones did. The NAP count is important in recognizing tundra and open forest conditions in the vegetational sequence. The profiles which identify and count NAP are considered to be more accurate in their representation of past vegetation.

A very important methodological change in pollen analysis has been to estimate the absolute pollen influx (API), expressed as the number of pollen grains per cm^2 per year (Davis 1969), instead of using raw percentages of the pollen grains. In the percentage method of interpretations, the pollen grains counted at each level are divided into percentages of specific genus that are represented in the profile. If the percentage for a genus increases from one level to the next, it is impossible to determine if this represents an actual increase of the genus in the vegetational composition of the area or if a decrease in the percentage of other genera has caused a false rise in the percentage of the first genus. Moreover, pollen percentage diagrams overrepresent high pollen producers and underrepresent low pollen producers. In tundra regions, pine pollen blown on to the tundra from distant forests could provide as much as 20% of the pollen deposited. As woodland and forest vegetation moved into the area more pine pollen was produced, but since

there also were greater numbers of other pollen types, the percentage value of pine only increased slightly (Davis 1969:326). API techniques have, in later profiles, clarified this confusion in the pollen record.

The use of radiocarbon dating on organic sediments from the pollen core has made the use of the API method possible. Radiocarbon dating has made it possible to measure the time represented by a unit of sediment thickness in the core, and therefore gives a time base for the measurement of the amount of pollen (Davis, 1969:323). Many of the older interpretations of New England vegetation are incorrect due to the problems of the percentage method, but when used in conjunction with profiles using the API method and radiocarbon dating, they can be useful in obtaining a vegetational sequence for New England.

Southern New England Vegetation 15,000 B.P. to Present

Prior to discussing the vegetational sequence of New England a very general idea of when deglaciation occurred and subsequently allowed vegetation to move into new areas, must be discussed. The Wisconsin ice sheet had advanced to its terminal position by 18,000 B.P. (Ogden 1977:23; Sirkin 1967:206), and recession had begun between 18,000 B.P., and 17,000 B.P. in eastern New Jersey and the Delaware Valley (Sirkin 1977:212). The glacier had begun to recede from its New England terminal position by approximately 15,300 B.P. (Davis et al. 1975:337). During the period of 14,000 to 12,000 B.P., dramatic changes took place in the extent and volume of the Wisconsin ice sheet (Ogden 1977:24). Central Connecticut was free of ice by 13,500 B.P. and central Massachusetts was free of ice by 13,000 B.P. (Bloom 1963). By 14,000 B.P. substantial areas of the continental shelf were free of ice and available for vegetational and human occupation (Ogden 1977:24). The Hudson Lobe of the Wisconsin ice sheet had receded as far as the Northern Champlain Valley by 12,600 B.P. (Sirkin 1977:212). By 13,500 B.P. the receding ice margins approximated the eastern coast of Maine (Davis et al. 1975:337), and between 12,500 B.P. and 12,000 B.P. all of New England was virtually ice free with the ice sheets margin laying northwest of the St. Lawrence Lowland (Borns 1962:37).

As the ice sheet retreated from southern New England a treeless, grassy tundra developed. This pollen zone is known as the Herb Pollen Zone (Davis 1965). Tundra vegetational conditions existed in southern New England from about 15,000 B.P. to 12,000 B.P. Pollen studies from Long Island, Block Island and Rhode Island suggest that open grasslands existed on the coastal plain and on the outwash near the terminal moraines of the ice sheet (Sirkin 1977:212). This position is supported by the presence of an abundant amount of grass, sedge, and composites found in the pollen diagrams (Sirkin 1967; 1977). This open grassland existed in these areas, with some spruce and pine, until the beginning of the pine forest at approximately 11,000 B.P. Therefore, a sparse spruce and pine forest and grassland existed along the terminal moraines during deglaciation while tundra vegetation migrated northward with the glacial margin (Sirkin 1977:212).

It is not entirely clear whether the Herb Pollen Zone represents a true tundra or if it was more similar to conditions which prevail in present day northern prairies (Davis 1967:26). In studies with modern analogs, the fossil pollen percentages do not resemble modern pollen percentages from tundra sites in Labrador. However, there are vast areas of tundra in more continental regions and the region of the northern prairie that have not been sampled yet, so a modern analog for the fossil Herb Pollen Zone could be found in one of these untested areas.

Using pollen influx data, which expresses the number of pollen grains in a square centimeter per year (Davis 1969:324), from modern and fossil pollen profiles it is evident that the fossil Herb Pollen Zone deposited in Connecticut may not have been as barren as the modern higher latitude tundra sites (Davis et al., 1975:448). In the basal pollen zone at Rodgers Lake, Connecticut, the pollen influx ranged from 500-1000 grains per square centimeter per year, which is a much higher range than the ranges of samples taken at tundra sites 230-1000 km from the tree line in Canada (Davis et al., 1975:447-448). It appears that the fossil vegetation was more dense than in present tundra areas.

The discovery of macrofossils in the sediment of pollen cores shows that the herb pollen zone bore floristic resemblances to tundra conditions. A core from Cambridge, Massachusetts, contained macrofossils of *Salix herbacea*, *Dryas integrifolia*, and *Vaccinium uliginosum* which are shade-intolerant plants, and indicate that trees did not grow in the immediate area of these plants (Argus and Davis 1962; Davis 1961:628; 1965:393). See Table 2 for a list of Latin and common floral names. However, it is possible that some scatters of trees did grow in the vicinity and that the area could have been inhabited by a forest-tundra type of environment, especially in the later phases of the Herb Pollen Zone.

Latin Name	Common Name
Abies Spp	Fir
Acer Spp	Maple
Betula Spp	Birch
Dryas integrifolia	Mountain Avens
Fagus Spp	Beech
Picea Spp	Spruce
Pinus Spp	Pine
Quercus Spp	Oak
Salix herbacia	Scrub Willow
Tsuga Spp	Hemlock
Vaccinium uliginosum	Whortleberry

Table 2: Latin and Common Names of Selected Flora (after House 1924)

There are many questions that remain unanswered concerning the Herb Pollen Zone, but quaternary specialists working in the Northeast agree that between deglaciation and circa 12,500 B.P., tundra conditions existed in southern New England which graded into a forest-tundra toward the end of this pollen zone and into the next (Davis 1967; 1969:331).

The Herb Pollen Zone is followed by the Spruce Pollen Zone in the southern New England vegetational sequence. The Spruce Pollen Zone has been divided into two major sections with the lower (earlier) section containing spruce and hardwood tree genera and the upper portion containing spruce and fir (Davis 1967), although in both sections spruce was the dominant vegetational type.

Pollen representing the spruce-hardwood subzone was deposited in southern New England 12,000 to 10,500 years B.P. (Davis 1967:29). The rise in hardwood tree percentages is believed to have been caused by an actual increase in the numbers of hardwood tree pollen grains, which was caused by an increase in the number of hardwood trees in the area. This change appears to have been the result of a change to a warmer climate during the Two Creeks interval of glacial retreat (Davis 1967).

The study on the pollen core from Rogers Lake, Connecticut, calculated the absolute pollen accumulation rates, which helps with the interpretation of the Spruce Pollen Zone (Davis 1967; Davis and Deevey 1964). There was an increase in deposition rates for coniferous-tree pollen types at the lower boundary of the spruce-hardwood subzone, dated at 12,000 B.P. Conifer pollen deposition rates continued to increase with spruce pollen reaching a maximum at 10,000 B.P. in the subsequent spruce-fir subzone. The Rogers Lake, Connecticut, core showed that hardwood tree pollen deposition rates sharply increased 11,800 years ago near the lower boundary of the spruce-hardwood subzone, which confirms the idea that the rise in the percentages of hardwood tree genera in pollen profiles from southern New England was actually due to the real increase in the number of hardwood trees. The deposition rate for hardwood tree pollen showed a very slight decline at the upper boundary of the spruce-hardwood section and remained constant until circa 9000

B.P. when it began to increase again (Davis 1967:30; 1965). This is a very different interpretation than that given by previous authors who saw a sharp decline in the percentages of warmth-demanding hardwood tree pollen and therefore inferred a cooler climate at the time of the Valders readvance, when actually it was the dilution of hardwood tree pollen by increasing numbers of conifer pollen. In fact, the Valders readvance took place circa 1000 years before the statistical decline in the hardwood tree pollen percentages that was observed in the profiles before absolute pollen accumulation studies were begun (Broecker and Farrand 1963; Davis 1965; 1967).

Davis (1967:30) concludes that the spruce-hardwood subzone represents a vegetational transition between tundra conditions and forest conditions. This conclusion is based on a continuing rise in the deposition rates of conifer pollen from the spruce-hardwood section of the Spruce Pollen Zone into the subsequent spruce-fir section. The forest-tundra vegetation that was present in southern New England 12,000 B.P. to 10,500 B.P. correlates with the final years of the Two Creeks Interval (Davis 1965; 1967).

There is little agreement between the fossil spruce-hardwood forests of the older Spruce Pollen Subzone and modern analogs. Studies from eastern Canada show that the fossil spruce-hardwood subzone does not represent a mixed spruce-hardwood forest (David 1967). At one time it was believed that the fossil Spruce-hardwood zone was similar to the mixed Spruce-hardwood forest that is presently growing south of the boreal spruce forests in eastern Canada (Davis 1958), but this has been disproven by further studies (Davis 1967:30-31). The modern assemblage that is most similar to the fossil assemblage is the spruce-oak woodland of southern Manitoba, except that the southern New England fossil assemblage has higher percentages of spruce and fir.

Overlying the Spruce-hardwood section of the Spruce Pollen zone is a section containing increased amounts of boreal species such as spruce and fir. Pollen from this Spruce-fir subzone was deposited in southern New England between 10,500 and 9,500 B.P. (Davis 1965:392; 1967:32).

In comparisons with modern pollen assemblages the fossil Spruce-fir subzone corresponds closely with samples from "open, park-like woodlands of black spruce, with an associated ground cover of lichens" of Northern Quebec (Davis 1967:32; 1969:321). Thus, the type of vegetation present in southern New England 12,000 B.P. to 9500 B.P. during Spruce Pollen zone was mostly that of a tundra-forest during the Spruce-hardwood subzone and an open spruce woodland during the spruce-fir subzone.

Butzer (1971:143-144) sees both the tundra and forest-tundra as optimal environments from the standpoint of hunting groups. The Pleistocene low-latitude tundra appears to have had carrying capacities significantly higher than recent higher latitude tundra regions. The fauna that would have been available to human groups in this area would have been caribou, mastodon, mammoth, musk-ox, bison, moose-elk, horse,

giant ground sloth, and possibly peccary (Funk 1972:9; 1967:7, 210; Funk, Weinman and Weinman 1969:16; Ritchie and Funk 1963:6; Salwen 1975:44). During the extreme winter months, many of the fauna from the tundra would have moved south to the forest-tundra for protection from storms and to supplement their diet by eating tree shoots and barks of trees. Therefore, the tundra and forest-tundra regions would have supported a significant number of faunal species on which early inhabitants of southern New England could have subsisted. The open spruce woodland would also have supported many faunal species, although a few of the more southerly species may have begun to migrate into the area. There are, of course, many factors which determine if an area is habitable by human groups, but based on the presumed faunal associations with tundra and forest-tundra environments, it is very likely that southern New England was occupied by human groups during the time span of the Herb Pollen and Spruce Pollen zones.

Overlying the Spruce Pollen zone is the Pine Pollen zone. In southern New England, Davis (1967:35-36) has divided the pine zone into two subzones. The oldest subzone is composed of pine-birch-alder while the later subzone is a pine-oak period. The entire Pine Pollen zone existed from 9500 B.P. to 7000 B.P. in southern New England. Approximately 9000 B.P., the pine pollen frequency increased, along with an increase of hardwood tree pollen such as birch and oak. These changes in the pollen profiles reflect the presence of a mixed coniferous-deciduous forest during the Pine Pollen zone in southern New England (Davis 1967:327).

The fossil Pine-birch-alder subzone is similar to modern groupings from central Canada and northern Minnesota. The modern samples were taken from an area 100 km south of the boundary between the boreal forest and the mixed coniferous-deciduous forest (Davis 1967:35), where there are high percentages of pine and birch pollen. This indicates that it was likely that a pine-birch-alder forest existed in southern New England during the transition from a coniferous forest to a deciduous forest beginning approximately 9500 B.P.

The overlying pine-oak assemblage resembles modern surface samples from southeastern and central Ontario in areas deep in the mixed coniferous-deciduous forest region (David 1967:36; 1969:327). This comparison would tend to indicate that it was possible for a coniferous-deciduous forest to have existed in southern New England during the upper Pine Pollen zone.

The coniferous-deciduous forests of the Pine Pollen zone would have been able to support faunal populations of elk, deer, moose, bear, and other smaller animals along with human populations over the entire region of southern New England. It is possible that short-lived closed boreal forests may have developed locally, but not so that they are recognized as a separate pollen zone (Davis 1967:34), and not on a regional basis as to interfere with faunal or human groups. The carrying capacity of the coniferous-deciduous forests may have been slightly lower than the

carrying capacity of the vegetation of the preceeding Herb Pollen and Spruce Pollen zones, but not low enough to make the areas uninhabitable.

Overlying the Pine Pollen zone in the pollen diagrams is the Deciduous Pollen zone. By the time this vegetational period began in 7000 B.P., the environment of southern New England as a whole was relatively stable. Drainage patterns similar to present patterns had been established, soils had developed and stabilized and the rate of sea level rise was slower than during the previous 3000 or 4000 years, although the level was still rising (Milliman and Enery 1968; Redfield 1967). The oldest Deciduous Pollen zone lasted from circa 7000 B.P. to 5000 B.P. and was composed mainly of oak and hemlock pollen. The second subzone was predominantly oak and hickory and lasted from circa 6000 B.P. to 2000 B.P.. The last Deciduous Pollen subzone existed from 2000 B.P. to the present and the main pollen types were oak, hemlock and chestnut (Davis 1965). The vegetational type represented by the Deciduous Pollen zone is an oak-hardwood forest composed predominantly of hardwoods such as oak, maple, birch, and elm.

In the second and third subzones of the Deciduous Pollen zone grass and sedge pollen, as well as other nonarboreal pollens, become more predominant in the pollen profiles (Hindle 1964). Pine also increases in the second and third subzones in some of the profiles (Davis 1958). It is thought that the increase of the conifers and nonarboreal pollen in the upper portions of the pollen profiles is due to the forest clearance activities of aboriginal and European inhabitants.

The carrying capacity of the deciduous forests before colonization would have been relatively higher than the previous coniferous-deciduous forests. Larger numbers and varieties of faunal species such as white-tailed deer, bear, racoon, rabbit and fowl, would have survived in southern New England. Additional plant foods, such as berries and nuts would also have been available for human and faunal consumption. Butzer (1971:151) rates the relative suitability of deciduous forests for hunter-gather groups as intermediate, based primarily on animal food resources.

The present day coastal areas of southern and northern New England would have had the same general vegetational sequence as interior areas. Present day coastal areas would have been interior regions in the glacial and early postglacial periods due to the lowered sea level. The continental shelf was exposed and presumably suitable for floral, faunal and human occupation. In the later stages of the vegetational sequences there may be some minor changes in the profiles of interior and coastal areas, but in general the profiles are similar.

Summary of Southern New England Vegetation Sequence

Table 3 presents a summary of the pollen zones, the pollen assemblage for each zone, and the vegetational type for each zone in southern New England from 15,000 B.P. to the present. In southern New England, the

first vegetation to appear after deglaciation was tundra which lasted until 12,000 B.P. (Herb Pollen zone). The next vegetational type that moved into the area was a forest-tundra composed of spruce and hardwoods which existed from 12,000 B.P. to 10,500 B.P. (Spruce Pollen zone). The forest-tundra was followed by a spruce woodland composed mainly of spruce and fir with slightly lesser amounts of hardwoods, which existed from 10,500 B.P. to 9500 B.P. (Spruce Pollen zone). The tundra, forest-tundra, and spruce woodland would have been able to support such mammals as caribou, mastodon, mammoth, moose-elk, musk-ox, bison, horse, giant beaver, ground sloth, and possibly peccary (Funk 1972:9; 1976:7, 210; Ritchie and Funk 1973:6; Salwen 1975:44). The spruce woodland was replaced by pine-birch-alder and pine-oak coniferous-deciduous forests which lasted from 9500 B.P. to 7000 B.P. (Pine Pollen zone). The coniferous-deciduous forests would have been able to support faunal populations of white-tailed deer, red fox, moose, turkey, marten, wolverine, lynx and migratory birds, in addition to fish, turtles and mussels (Funk 1977). The coniferous-deciduous forests were succeeded by deciduous forests (Deciduous Pollen zone) of oak-hemlock from 7000 B.P. to 5000 B.P., oak-hickory from 5000 B.P. to 2000 B.P., and oak-chestnut from 2000 B.P. to the present. The deciduous forests supported faunal populations similar to those of the coniferous-deciduous forests but in greater number and variety.

It is apparent that the vegetation of southern New England after deglaciation began with tundra, changed to forest-tundra conditions, followed by a spruce woodland and then changed to a mixed coniferous-deciduous forest before a closed boreal forest could develop (Davis 1969:331; Funk 1967:209), which was followed by deciduous forests. All of these vegetational zones were habitable by human groups.

The areas of Fort Devens and Hingham, Massachusetts, Fort Greene, Rhode Island, and the facilities in southern Connecticut would have had the same vegetational sequence as outlined above. There would have been local differences in each of the areas but the only way to document these differences would be to obtain a pollen profile from each locality. A sufficient number of pollen profiles have been analyzed to justify the assumption that the entire southern New England region went through the same general vegetational sequence.

DATE (B.P.)	POLLEN ZONE	POLLEN ASSEMBLAGE	VEGETATIONAL TYPE
Present 500 1000 1500	DECIDUOUS	OAK - CHESTNUT HEMLOCK	HARDWOOD FOREST
2000 2500 3000 3500 4000 4500	DECIDUOUS	OAK - HICKORY	HARDWOOD FOREST
5000 5500 6000 6500	DECIDUOUS	OAK - HEMLOCK	HARDWOOD FOREST
7000 7500 8000	PINE HEMLOCK	PINE - OAK	CONIFER - HARDWOOD FOREST
8500 9000	PINE	PINE - ALDER BIRCH	CONIFER - HARDWOOD FOREST
9500 10,000 10,500	SPRUCE	SPRUCE - FIR	SPRUCE WOODLAND
11,000 11,500	SPRUCE	SPRUCE - HARDWOOD	FOREST TUNDRA
12,000 12,500 13,000	HERB	HERB, GRASSES, SEDGES	TUNDRA
13,500 14,000 15,000		GLACIATED	

TABLE 3: Summary of Southern New England Vegetational Sequence (For Reference See Text).

Present Day Southern New England

Descriptions of the present day vegetation of southern New England can mainly be found in Kuechler (1964) and will be described according to the physiographic regions as defined by Wallace (this volume). Some of the physiographic regions of New England are located in both the southern and northern portions of the area. In his study Kuechler defines the potential natural vegetation of the area. This means that he has mapped the vegetational types that would exist today if humans were removed from the area and if the resulting plant succession could be viewed at a single time, that time being 1964 for his study (See Figure III-1).

The Taconic Section vegetation is Northern Hardwood Forest, Northern Hardwoods-Spruce Forest, and Northeastern Spruce-Fir Forest. This area would include such species as sugar maple, yellow birch, beech, hemlock, spruce and fir. The area is covered with tall broadleaf deciduous forests with an admixture of needleleaf coniferous trees. The Taconic Section generally consists of low mountains less than 600 meters above sea level. There are several large valleys which were modified by glacial activities and valley sediments are dominated by post glacial lake clays and deltaic sands. The major soils of the Taconic Section in southern New England is gray-brown podzol which is relatively acid and well drained.

The Connecticut Lowlands are covered by an Appalachian Oak Forest composed of white oak and northern red oak. This vegetational type is a tall broadleaf deciduous forest which grows on well drained brown podzol soils. The area generally has low relief, but igneous units form ridges where ever they crop out.

The New England Upland physiographic region is the largest in the area. Its elevation ranges from 150 meters above sea level at its eastern margin to 350 meters above sea level inland, with some monadnocks as high as 900 meters. The vegetation of the upland is the Appalachian Oak Forest in Connecticut and Rhode Island, the Northern Hardwood Forest in Massachusetts and a transitional forest between the Northern Hardwood Forest and the Appalachian Oak Forest. The soils in this region in southern New England are relatively well drained, acidic, brown podzols.

The Coastal Lowland physiographic region is a strip of land along the eastern seaboard that is geologically similar to the adjacent New England Upland but with generally lower relief. The vegetation type present in the southern New England Coastal Lowland region is the Appalachian Oak Forest which, in most areas, is a tall broadleaf deciduous forest. The soils in this region are for the most part brown podzols which may be thicker here than in more mountainous areas. A portion of eastern Rhode Island and adjacent southwestern Massachusetts are covered by gray-brown podzols.

The present day vegetation of all of New England is very complex and difficult to classify because the changes from one type to another are

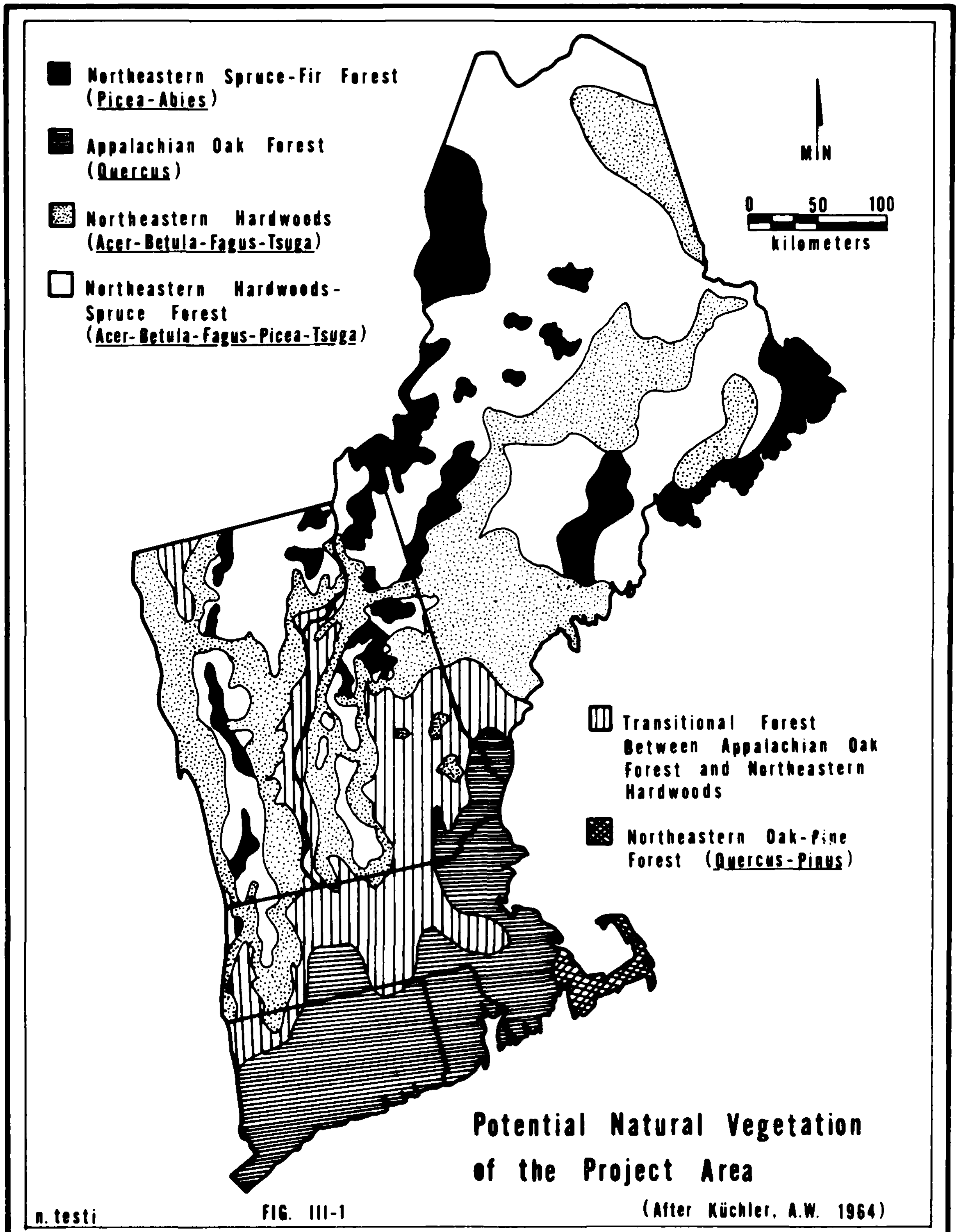

Northeastern Spruce-Fir Forest (Picea-Abies)
Appalachian Oak Forest (Quercus)
Northeastern Hardwoods (Acer-Betula-Fagus-Tsuga)
Northeastern Hardwoods-Spruce Forest (Acer-Betula-Fagus-Picea-Tsuga)
MN
0 50 100
kilometers
Transitional Forest Between Appalachian Oak Forest and Northeastern Hardwoods
Northeastern Oak-Pine Forest (Quercus-Pinus)
Potential Natural Vegetation of the Project Area
n. testi
(After Küchler, A.W. 1964)

FIG. III-1

subtle. In addition, if the same general vegetational type of forest exists in two different areas, the actual forests may not be composed of the same plant genera due to differences in soil, elevation, drainage, and location in the general vegetational area. The same forest types exist in southern and northern New England but their make-up is different in that the northern forests contain more conifers.

A vegetation type present in all of New England is the Conifer Bog. These areas are described as "dense to open, low to medium tall forests of needleleaf evergreen or deciduous trees. The more open parts have a dense undergrowth." (Kuechler 1964:94). The dominant vegetational genera are larch, black spruce and arbor vitae or white cedar. These bogs are present throughout the entire area.

The facilities at Shelton and Waterbury, Connecticut, and Fort Devens, Massachusetts, are located in the New England Upland physiographic region. The New Haven, Connecticut, and Springfield, Massachusetts, facilities are located in the Connecticut Lowland region. The Middletown, Connecticut, facility is located on the eastern boundary between the New England Upland and the Connecticut Lowland regions. Located on the boundary between the Taconic Section and the Green Mountains regions is the facility at Pittsfield, Massachusetts. The facilities at Brockton, Taunton and Hingham, Massachusetts, and Warwick and Fort Greene, Rhode Island, are located in the Coastal Lowland physiographic region.

As discussed above, all portions of the southern New England vegetational sequence were potentially exploitable by faunal and human groups, although to a different degree and with different adaptations in the various zones. It is therefore possible to correlate southern New England's culture history and vegetational sequence as shown in Table 4.

Paleo-Indian groups exploited the tundra, forest-tundra and a portion of the open spruce woodland habitats that existed in southern New England approximately from 12,500 B.P. to 10,500 B.P. For the most part, these environments would have supported such fauna as caribou, mastodons, mammoths, musk-ox, bison, and moose-elk (Funk 1972:9), with more southerly species of fauna migrating into the area toward the end of the spruce woodland vegetational phase. It would seem that the Paleo-Indian groups of southern New England were predominantly large game hunters adapted to tundra, forest-tundra, and spruce woodland environments.

The Archaic period lasted from 10,000 B.P. to 5000 B.P. in southern New England. The major subsistence activities of the Archaic period were centered around hunting, fishing, and gathering (Ritchie 1969).

DATE (B.P.)	VEGETATIONAL TYPE	STAGE - PERIOD	PHASE - COMPLEX
500			
	OAK - HEMLOCK	LATE WOODLAND	WINDSOR SHANTOK
1000			
	CHESTNUT-HARDWOOD		JACK'S REEF
1500		MIDDLE WOODLAND	FOX CREEK
			ROSSVILLE
2000	FOREST	EARLY WOODLAND	LAGOON
2500	OAK - HICKORY	TRANSITIONAL	ORIENT MEADOWOOD
3000			COBURN
	HARDWOOD FOREST		WATERTOWN
3500			ATLANTIC
4000		LATE ARCHAIC	SQUIBNOCKET
4500			
5000			BREWERTON VOSBURGH
5500	OAK - HEMLOCK		OTTER CREEK
6000	HARDWOOD FOREST	MIDDLE ARCHAIC	STARK
6500			
7000			
			NEVILLE
7500			
8000	CONIFER-HARDWOOD		
8500	FOREST		PALMER KIRK
9000		EARLY ARCHAIC	
9500			
	SPRUCE WOODLAND		
10,000			
10,500		PALEO - INDIAN	CLOVIS
11,000			
	FOREST TUNDRA		
11,500			
12,000		GLACIATED	
12,500	TUNDRA		

TABLE 4: Correlation of Southern New England's Vegetational and Culture Sequences.

During the Early Archaic Kirk and Palmer phases, these subsistence activities were carried out in a spruce woodland and mixed coniferous-deciduous vegetational setting. The Middle Archaic Neville phase existed during the time of the coniferous-deciduous forest, while the remainder of the Middle Archaic was in the oak-hemlock deciduous forest setting. The Late Archaic groups exploited the oak-hickory deciduous forest environment, as did the Transitional and Early Woodland groups. The Middle and Late Woodland groups exploited oak-hemlock-chestnut deciduous forests. In addition to subsistence activities such as hunting, gathering, and fishing, these groups were agriculturists planting crops of corn, beans and squash.

Northern New England Vegetation 15,000 B.P. to Present

The reconstruction of the northern New England vegetational sequence is derived primarily from Davis et al. (1975). This pollen study was carried out in south central Maine and employed the most recent palynological and statistical methods. There are problems with using just one pollen core to represent the vegetation of an area, but this is the most recent diagram and for the most part the older diagrams from Maine agree with it (Deevey 1951).

The vegetation of northern New England began with tundra conditions. The Tundra period began approximately 14,000 B.P. and ended 9700 B.P. The Tundra period has been divided into four subzones: Ia from deglaciation to 13,500 B.P.; Ib dated 13,500 B.P. to 12,400 B.P.; Ic dated 12,400 B.P. to 10,500 B.P.; and Id dated 10,500 B.P. to 9700 B.P. The pollen of Ia and Ib represented sparse herb tundra conditions. During the Ic subzone, the tundra vegetation became more luxuriant and shrubby. The vegetation during the Id subzone changed from tundra to woodland. This transition from tundra to woodland conditions began about 1700 years earlier in southern New England (Davis 1969).

The Tundra period had very low pollen influx values. Except for the top of the Tundra period, the pollen influx values ranged from 150 to 920 grains per square centimeter per year which is slightly lower than the 500 to 1000 grains per square centimeter per year in the tundra zone at Rogers Lake, Connecticut (Davis 1969). The fossil northern New England influx range is greater than the estimated deposition rates of 5-90 grains per square centimeter per year from samples set out in present day tundra areas of Canada. These influx values imply that the tundra vegetation of northern New England may not have been as barren as the present day "high tundra" sites (Davis et al. 1975:448).

Overlying the Tundra period is the Conifer-Hardwood period which has been divided into two subzones, IIa and IIb. Subzone IIa existed from 9700 B.P. to 7100 B.P. and corresponds to Deevey's pine zone (1939; 1951). Judging from the pine pollen influx values, it seems that pine trees were important in the forests of northern New England but not dominant. Oak was presumably of equal importance as pine in the forests. Birch and alder were also important. Hemlock arrived near

Moulton Pond around 8200 B.P. but may not have grown in the immediate area for another 1000 years. The high nonarboreal pollen values found in the profile imply that the forests of this period were open and successional in character. The most similar modern equivalents to the pine-oak forests of northern New England are pine-northern hardwood forests, northern transitional forests and oak forests (Davis et al 1975:452-453).

Subzone IIb existed from 7100 to 4700 B.P. in northern New England. Pine, birch and oak are very important components of the forests of this time, as is hemlock. Pollen from mesic hardwoods, such as maple and elm, become consistently present at low to moderate levels, and along with hemlock, indicate the increasing diversity of the coniferous-deciduous forests. The different pollen assemblage and lower nonarboreal pollen values, as compared to the preceding subzone, indicate that the vegetation of northern New England between 7100 B.P. and 4700 B.P. was less open than during 9700 B.P. to 7100 B.P. (Davis et al 1975:453-454).

The next pollen zone is the Hardwood-Conifer period, dated 4700 B.P. to 200 B.P. By this time, all taxa found in northern New England pollen assemblages had reached the area. The pollen of this period represents hardwood dominated mixed forests with proportions of hardwood species higher than in the previous Conifer-Hardwood period. The beginning of the Hardwood-Conifer period centers from northern hardwood forests and appalachian oak forests.

At approximately 3700 B.P. there was a shift to a more southerly forest. From this time to about 2000 B.P. is a period of closed mesic temperate hardwood-hemlock forests. At about 2000 B.P. the pollen profile suggests an increase in environmental severity because proportions of spruce pollen and nonarboreal pollen begin to increase and the proportions of pollen of hemlock and mesic temperate hardwoods start to decrease. These trends continue into the next pollen period (Davis et al 1975:454-455).

The last pollen zone is the European period which started at 200 B.P. and continues until the present time. This forest corresponds with the northeastern portion of the conifer-hardwood forest.

Summary of Northern New England Vegetational Sequence

Table 5 presents a summary of the pollen zones, the pollen assemblage for each zone, and the vegetational type for each zone in northern New England from 14,000 B.P. to the present. In northern New England, the first vegetation after deglaciation was that of a tundra which lasted until 10,500 B.P. The next vegetational type to move into the area was a woodland of birch, pine, spruce, alder and grasses, dating 10,500 B.P. to 9700 B.P.. The next vegetational type was conifer-hardwood forests of pine, oak, and birch from 9700 B.P. to 7100 B.P. and hemlock and mesic hardwoods from 7100 B.P. to 4700 B.P.. The conifer-hardwood forests were followed by hardwood-conifer forests, with less conifers than previously,

from 4700 B.P. to 200 B.P.. The final vegetational type in northern New England is the present day conifer-hardwood forests.

There are some very important differences between the vegetational sequences of northern and southern New England. The first main difference between the two sequences is the lack of a spruce dominated forest in northern New England, while there was one in southern New England between 12,000 B.P. and 9000 B.P. Briefly, it seems that boreal species moved into southern New England first and eventually seeds of boreal and hardwood species moved northward during the centuries of ameliorating edaphic conditions. "As time progressed, and distance northward increased, temperate species were able to survive in increasing proportions." (Davis et al. 1975:458). By circa 10,000 B.P. trees were becoming established in northern New England, including pine, oak, and birch. The temperate species constituted large portions of the incoming species, and environmental conditions favored their success in the competition. This idea implies that while conifers dominated southern New England from 12,000 B.P. to 9000 B.P., temperate taxa had spread into more northerly areas.

The second difference between the northern and southern New England vegetational sequences is that a hardwood forest did not develop in northern New England as it did in southern New England. As will be discussed, the present day forests of northern New England are mixed coniferous-deciduous forests and transitional forests.

The types of fauna supported by the northern New England forests would have been generally the same as the southern New England forests. The sparseness of the early Tundra period in northern New England may have made survival in the area very hard, if not impossible. However, by 12,000 B.P. the tundra had developed enough to allow faunal and human groups to exploit its resources. More northerly species would have been present in northern New England since a hardwood forest did not develop to make southerly species migrate northward. All of the northern New England forests would have been able to support faunal and human populations.

Present Day Northern New England

The descriptions of present day vegetation, as with southern New England, will be described according to physiographic regions as obtained from Kuechler (1964). The northern part of the Taconic Section and the entirety of the Champlain Lowlands are covered with a Northern Hardwoods forest. The Taconic Section has acidic gray-brown podzol and lithosoil soils, while the Champlain Lowlands have poorly drained ground water podzol soils. The Champlain Lowlands is an area of generally low relief.

The Green Mountains region is predominantly covered by a northern hardwoods spruce forest composed of maple, birch, beech, spruce and

hemlock. The Green Mountains have soils of lithosoil and light-colored podzols. The maximum elevation of this region is 1200 meters above sea level with the prevalent altitude around 900 meters above sea level.

The White Mountain Region is covered by northern hardwoods spruce forests and northeastern spruce-fir forests, with the hardwoods spruce forests more prevalent. The soils of these mountains are lithosoil and light-colored podzols, as with the Green Mountains. This region rises well above the level of the adjacent New England Upland and the elevations of the highest peaks are over 1500 meters above sea level.

The northern part of the New England Upland region is diversified in its vegetational cover. The border between New Hampshire and Vermont is covered by a transitional forest between the northern hardwoods forests and the appalachian oak forests, as is southeastern New Hampshire and a small section of southern Maine. A northern hardwoods forest covers central Vermont, central New Hampshire, south, central and northeastern Maine. Central New Hampshire also has areas of northeastern spruce-fir forests, as does northern and eastern Maine. The soils of the northern New England Upland are predominantly lithosoil and light-colored podzols.

The Coastal Lowland Region of northern New England is covered by an Appalachian oak forest in New Hampshire and the very southern tip of Maine and in the remainder of Maine, south to north, northern hardwoods forests, northern hardwoods-spruce forest, and northeastern spruce-fir forests. The soils of this region are mainly brown podzols with some ground water podzols.

The facilities located at Montpelier, Vermont, and Bridgton and Dexter, Maine are located in the New England Upland physiographic region. The Manchester, New Hampshire, facility is located on the border of the New England Upland and Coastal Lowland regions.

As discussed previously, all portions of the northern New England vegetational sequence since about 12,000 B.P. were potentially exploitable by faunal and human populations. As with southern New England, it is possible to correlate northern New England's culture history with its vegetational sequence. This correlation is shown on Table 6.

DATE (B.P.)	POLLEN PERIOD	POLLEN ASSEMBLAGE	VEGETATIONAL TYPE
Present	EUROPEAN	SPRUCE FIR - GRASSES	CONIFER - HARDWOOD
500 1000 1500 2000 2500 3000 3500 4000 4500	HARDWOOD - CONIFER	HEMLOCK - HARDWOODS	HARDWOOD - CONIFER FOREST
5000 5500 6000 6500	CONIFER - HARDWOOD	HEMLOCK - HARDWOODS	CONIFER - HARDWOOD FOREST
7000 7500 8000 8500 9000 9500	CONIFER - HARDWOOD	PINE - OAK - BIRCH	CONIFER - HARDWOOD FOREST
10,000 10,500	TUNDRA WOODLAND	BIRCH - PINE SPRUCE - ALDER GRASSES	WOODLAND
11,000 11,500 12,000	TUNDRA	HERBS - GRASSES SEDGES - FERNS	SHRUBBY TUNDRA
12,500 13,000	TUNDRA	HERBS - GRASSES SEDGES	SPARSE TUNDRA
13,500	TUNDRA	HERBS - GRASSES SEDGES	SPARSE TUNDRA
14,000 15,000	GLACIATED		

TABLE 5: Northern New England's Vegetational Sequence. (For References See Text.)

DATE (B.P.)	VEGETATIONAL TYPE	STAGE - PERIOD
500		
1000		WOODLAND
1500		
2000		
2500	HARDWOOD - CONIFER FOREST	
3000		
3500		TRANSITIONAL
4000		
4500		
5000	CONIFER - HARDWOOD FOREST	
5500		
6000		MIDDLE ARCHAIC
6500		
7000		
7500		
8000	CONIFER - HARDWOOD FOREST	
8500		EARLY ARCHAIC
9000		
9500		
10,000		
10,500		
11,000	TUNDRA	PALEO - INDIAN
11,500		
12,000		
12,500		

TABLE 6: Correlation of Southern New England's Vegetational and Culture Sequences.

CHAPTER 4

CULTURE HISTORY AND LAND USE PATTERNS IN SOUTHERN NEW ENGLAND

For at least 12,000 years human populations have inhabited New England and by means of their technology and social institutions have exploited and adapted to the natural environments in which they were situated. This chapter briefly discusses the broad outlines of these adaptations as they are reflected in the archaeological (See Table 7), and, for the last 500, years the historic record.

This history was written for three interrelated purposes:

(1) To provide information which was used to generate models of site types and locations through time. These models were utilized together with sampling techniques to assist in the efficient location of archaeological sites during the project's field investigation phase.

(2) To place discovered sites within cultural, spatial, and temporal contexts, i.e., to assist in the evaluation of the significance of sites.

(3) To provide a currently unavailable, up to date, detailed summary of the major units, boundaries, trends, and debates on the prehistory, ethnohistory and history of southern New England.

Since the majority of our work was located in southern New England, (only two of the 67 facilities were located in northern New England), the focus of the culture history was directed to that geographic area. Overall the cultural historical sequence for northern New England is similar to that for southern New England, except that in some instances the dates appear to be later. Wherever significant differences appear, they will be discussed in the text.

Appended to the general cultural history are more detailed cultural histories of the Fort Devens area, the Hingham area, and the Fort Greene area. Since these are by far the largest facilities, it was felt that a more detailed review of cultural developments here would (1) assist in the sampling design and (2) help place identified sites in their spatial and temporal contexts.

Prehistoric Period (10,500 B.C. to 1520 B.C.)

Paleo-Indian Period (10,500-8000 B.C.)

About 15,000 B.C. the last cycle of the Wisconsin deglaciation began (Funk 1978:16). By 11,500 B.C. the glaciers had melted back, exposing

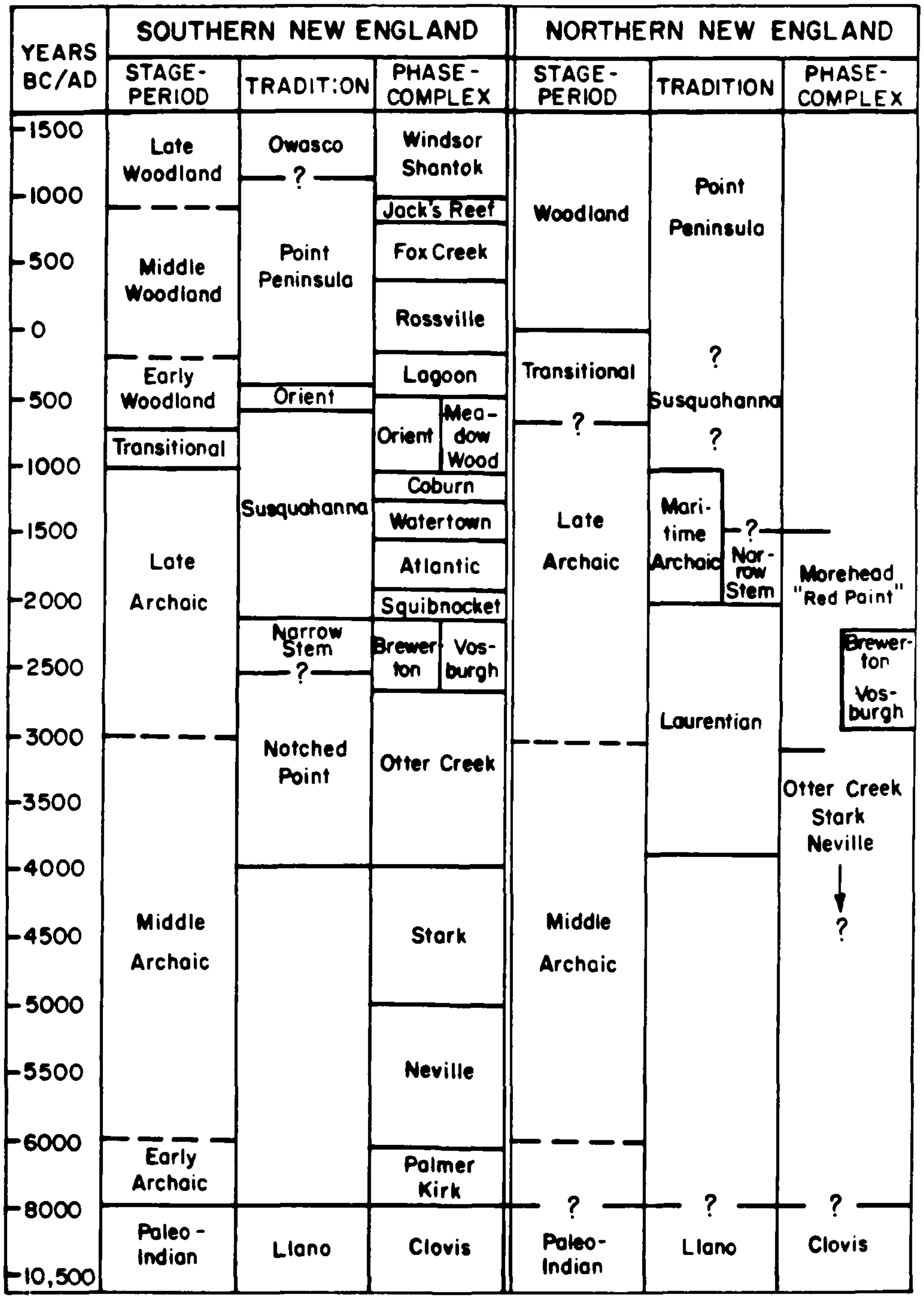


Table 7: Prehistoric Cultural Sequence for New England.

southern New England (Dincauze 1974:43). By 10,500 B.C. the ice boundary was northwest of the St. Lawrence lowland (Dekin et al., 1978:82). Because of the enormous volume of water contained in the glaciers, sea level at this time was significantly below the present level. Even as late as 9000 B.C. sea level was still about 30 meters below that of the present day (Salwen 1975:43).

Gradually, as the ice receded, it was replaced in southern New England by a spruce forest and tundra which lasted until the end of the Paleo-Indian period. (Dincauze 1974:43, Dincauze and Meyer 1976:3). This environment was apparently very favorable to such megafauna as mastadon, giant beaver, and caribou. It is presumed that all three of these species were hunted by the resident human populations (Dincauze 1974:43). However, the only direct association between the Paleo-Indians and the local megafauna was discovered when the excavations at Dutchess Quarry Cave produced a caribou bone near a Cumberland-like fluted point (Funk et al. 1969). Ritchie (1957:6) and Salwen (175:45) contend that a wide variety of animal and vegetable resources probably were utilized by the Paleo-Indians. One piece of evidence to support this conjecture is the presence of fish bone in a charcoal le.is at the Shawnee-Minisink Site on the Delaware River (Salwen 1975:45).

The prime diagnostic artifact of this period is the fluted, bifacial, lanceolate point. These points were fashioned in a number of styles but the most common in New England is termed Clovis. By the late Paleo-Indian period, however, fluted points had disappeared or evolved into non-fluted lanceolate or parallel-flaked points (Warner 1975:3). Also very common on these sites are biface knives, biface preforms, end scrapers, side scrapers, flake knives, and other unifaces (Funk 1978:17).

Important sites of this period which are located in the Northeast are the Meadowcraft Rockshelter and the Shawnee-Minisink Site in Pennsylvania, Dutchess Quarry Cave and West Athens Hill in New York, the Reagan Site in Vermont, the Wapanucket No. 8 Site and the Bull Brook Site in Massachusetts, and the Debert Site in Nova Scotia. The Meadowcraft Site is especially important because of its early date of 14,000 B.C. (Adovasio et al., 1977:152).

Sites of this period are found on "high well drained ground" (knolls) or in caves or rockshelters (Funk 1972:23, Ritchie and Funk 1973:334). These knolls were probably used as posts to observe the movement of migratory animals which appear to have been the main food source of the Paleo-Indians (Funk 1978:18). Settlement types consisted of small camps (open or rockshelter), large camps, and quarry-workshops (Ritchie and Funk 1973:334).

Exotic lithics are found in almost every assemblage (Ritchie and Funk 1973:335). This suggests that these groups had fairly large territories and that they moved about these territories frequently (Ritchie and Funk 1973:336, Casjens 1977:38). Some of the larger sites could have been occupied year around (Ritchie and Funk 1973:335). There is general

agreement that overall population densities were low and that the local groups were also fairly small.

For northern New England, the most important site is the Debert site in nearby Nova Scotia, dating 8700-8600 B.C. (Sanger 1973b:2). Both Bourque (1975:40) and Tuck (1955:140) postulate a continuous occupation of Maine since Paleo-Indian times.

Archaic period (8000-500 B.C.)

The Archaic was an enormously long period during which many successive generations of New England inhabitants adapted to their environment. Intensive small game hunting, gathering, and fishing were the prime subsistence activities, compared to the reliance on megafauna of the Paleo-Indian period and the horticulture of the Late Woodland period.

Before delineating in some detail the various subperiods, phases, and complexes of the Archaic, it is perhaps wise to comment on the debate which has occurred within the field as to the reality of population fluctuation within this time period. Up to the present time, only a few sites are reported in New England and New York for the Early and Middle Archaic periods. By contrast, many more sites are reported for the Late Archaic and Transitional period. Traditionally, this difference has been interpreted as reflecting poor environmental conditions during the Early and Middle Archaic, which in turn could not support large human populations. It has been more recently suggested that part of the explanation for the lack of Early and Middle Archaic sites might be the result of inappropriate sampling methods (testing in the wrong places and/or to an insufficient depth) or might reflect the possibility that a high percentage of the earlier sites might have been destroyed by natural forces, such as erosion. However, neither of these explanations seem appropriate to explain the paucity of Early Woodland and Early Middle Woodland sites which are bracketed by large numbers of Late Archaic and Late Woodland sites. If in the case of the Early Woodland it is conceded that a genuine population decline occurred during this period, it is conceivable that such population fluctuation could have occurred earlier. Even if this later fluctuation had not occurred, there still exist no prima facie reason to reject, as some have, that genuine population fluctuations could explain the variation in the number and size of sites through time.

Early Archaic (8000-6000 B.C.). After 8000 B.C., widespread warming occurred throughout North America (Curran and Dincauze 1977:339), and New England's forest cover evolved either into a boreal-coniferous forest (8000-5000 B.C.) (Fitting 1968, Ritchie 1969:212-213) or mixed deciduous-coniferous forest (7500-6000 B.C.) (Dincauze 1974:44). This boreal-coniferous forest, if similar to modern boreal forests, would have had a greatly decreased carrying capacity (Fitting 1968), while the deciduous-coniferous forest would have been biotically richer than the preceding tundra (Dincauze 1974:44).

Following these postulated climatic changes, the large megafauna of the Paleo-Indian period apparently disappeared (Funk 1978:19). Fluted points also disappeared and were replaced by smaller points of the "Bifurcate-Base" tradition, such as Hathaway, Palmer, and Kirk. Bifurcate points are widespread in their distribution and appear to be strongly represented in the southeastern United States where they have been found in dated assemblages. In New England, bifurcate points have been found throughout southern New England as far north as Lake Winnipesaukee. They appear to be somewhat concentrated in the Narragansett Basin, although, even here they are not represented in large numbers (Dincauze 1974:44-45).

There have been no sites or assemblages discovered in southern New England which date to the eighth millenium, B.C. (Dincauze 1964:4). Because of the lack of points and sites, Salwen (1975:47) postulates that there appears to be a real gap in occupation of the Northeast at this time. This postulated hiatus might not be as severe as once thought since bifurcate point sites have been recently discovered on the Housatonic River (Swigart 1977:69), Lake George (Hammer, n.d.) and on Staten Island (Ritchie and Funk 1971). In addition, the Gardepe Site in east-central New York has produced a bifurcate point which may be associated with a feature dated to 7430 B.C. (Funk 1978:22). Dincauze and Mulholland (1977:44) have postulated that sites of this period might "have a distribution distinct from later sites and cannot be found by search methods dependent on modern landscape features."

Generally, bifurcate points are found adjacent to large bodies of water and modern estuaries (Dincauze 1974:44-45). Based on the concentration of points in the Narragansett Basin, it has been suggested (Dincauze 1974:44-45) that year round habitation of this area was occurring at this time. This concentration also suggests that many sites of this period might have subsequently been inundated by rising sea levels. Throughout this period, small camps appear to have been the characteristic site type. They were probably occupied by small bands, or even family units (Ritchie and Funk 1973:337).

In the Housatonic Swigert (1977:69) notes that there are twice as many bifurcate points and sites per century as those of the Paleo-Indian period, thus suggesting that the Early Archaic was a time of population expansion. Even given the increasing number of finds, most authorities appear to agree that the population of this period was extremely low and perhaps virtually non-existent (Funk 1978, Ritchie 1959; Ritchie and Funk 1973:33). Few, if any, sites or artifacts dating from 9000 to 6000 B.C. have been found in northern New England (Fitzhugh 1972:4).

Middle Archaic (6000-3000 B.C.). After 6500 B.C. a mixed pine-oak forest was established in southern New England (Dincauze 1977:450) while northern Maine still had a boreal-coniferous forest, and the rest of northern New England had a maple-beech-hemlock forest (Fitzhugh 1972:5). With continued climatic warming through the fifth millennium B.C., the range of oak trees expanded northward along the coastal rivers (Dincauze

1974:45). In southern New England, settlement follows rather than precedes the 20% oak isopoll's northward progression (Dincauze and Mulholland 1977:447). After 4000 B.C. the oak-pine forest was replaced by one of oak-hickory (Ritchie 1969:213).

Large faunal populations existed at this time and these included white tailed deer, black bear, elk or wapiti, many small mammals, birds, turtles, fish and shellfish. In additon, the flora of the area and period was represented by tubers, nuts, seeds and other plant foods (Funk 1978:19). Spawning runs of fish and seasonal migrations of birds were also occurring at this time (Dincauze 1974:45). Deer and moose were by this time probably replacing caribou as the most important large game resource (Dincauze 1976:119).

By 5500 B.C. sea mammals were being exploited in South Labrador (Fitzhugh 1975:5). Oyster collecting was probably taking place on the lower Hudson around 4900 B.C. (Brennan 1974:81). The Otter Creek level at the McCulley No. 1 Site in New York, dated 3780 B.C., has produced the earliest clear cut evidence of the harvesting of most food (Funk 1978:21, 27). The Neville Site, with occupations dating to the fifth and sixth millennia B.C., is located to exploit the spring fishing runs up the Merrimack River (Dincauze 1976:120-124).

Leading diagnostics of this period include stemmed points (Neville, Stark, Merrimack) and side notched points (Otter Creek). New tool types consist of woodworking and milling tools of ground stone, weights for spear throwers, and fishhooks (Casjens 1977:39). Neville and Stark points appear to concentrate in southern New England but similar point types have also been found in southern Labrador and Maine (Sanger 1975:61; Tuck 1975:140).

The Neville Complex (6000-5000 B.C.) and the Stark complex (5000-4000 B.C.) are similar in age, cultural inventory, and style to the Morrow Mountain complexes of North Carolina (Dincauze 1971:194). Neville points apparently evolved into Stark points (Dincauze 1971:194). Besides the characteristic points, the Neville Complex consists of some Stark points, unshafted flake scrapers, small quartz scrapers, knives, perforators, biface preforms, hammers, and choppers (Dincauze 1976:120). The Stark complex is similar to the Neville in its inventory and was initially accompanied by Neville points and later by Merrimack points. Ground stone artifacts also appear at this time and include the winged atlatl weight and the full grooved axe (Dincauze 1976:121).

Elements of what Ritchie originally defined as the Laurentian tradition appear to have filtered into southern New England after 4000 B.C. (Dincauze 1975:26). The Proto-Laurentian may have originated some 500 years earlier in the maple-beech-hemlock forest zone of the Great Lakes, the St. Lawrence and Ottawa Rivers, and in northern New England (Fitzhugh 1972:10-11).

The Vergennes phase is the earliest manifestation of the Laurentian tradition and what has been termed its "classic" expression (Ritchie 1968:3). It consists of various ground slate tools, a number of copper implements, as well as large, predominately notched projectile points (Otter Creek) (Ritchie 1968). Vergennes sites appear to be concentrated in the St. Lawrence and Champlain Valleys and to postdate 3300 B.C. (Funk 1978:25; Ritchie 1958:5). Vergennes-like material has been also found in Maine and New Brunswick (Bourque 1975:40).

Otter Creek points and other "Laurentian" artifacts are now known to precede the establishment of the Vergennes phase and to exceed the complex in its range. Neither the Vergennes phase, nor any other Laurentian phases, appear to be represented in southern New England, although Otter Creek points are weakly represented throughout the region. Ground slate tools, which were once thought to be an exclusive element in the Laurentian, appear in southern New England to be associated with Neville and Stark points (Dincauze 1975:26; 1976:136). As a result of these factors Dincauze (1975:26) proposes that Laurentian-like manifestations in southern New England be grouped under the rubric Notched-Point Stylistic horizon.

During the sixth millennium B.C., the sites throughout New England increased in size and became more differentiated. This trend continued into the fifth millennium B.C. with territoriality becoming more delimited (Dincauze and Mulholland 1977:452). In southeastern New England there were three preferred locales for site locations: riverside, lakeside, and bogside. Evidence suggests seasonal population movement and exploitation of spring fish runs and fall migrations of birds, as well as winter ice fishing (Dincauze 1974:45, Dincauze and Meyer 1975:6:4). Especially large camps appear to have been located adjacent to falls on those rivers which had large spring runs of anadromous fish (Dincauze and Mulholland 1977:441).

In general, Middle Archaic occupations of the Northeast are "weak and scattered" (Ritchie 1971:3). Points from this period appear to be poorly represented in the central Housatonic River (Swigart 1977:62). Overall, population densities of the Middle Archaic appear to have been lower than that of the Late Archaic but at least equal to that of the Transitional and Early Woodland (Dincauze and Mulholland 1977:441).

Late Archaic (3000-1000 B.C.) Transitional (1000-500 B.C.). By 3000 B.C. climatic warming was at a maximum. As a result the range of many modern species extended further north than they are now found. An oak-hickory forest existed, mast was in abundance, and large animal populations such as deer and turkey were present (Dincauze 1974:47). Dekin (1978:85), however, maintains that from 2700 to 1400 B.C. a decline in carrying capacity set in. From 2500 to 2100 B.C., sea level rise decreased rapidly (Braun 1974:586). According to Turnbaugh (1975:59) sea level reached its present level as early as 2000 B.C., however, Salwen (1975:44) maintains that at 1000 B.C. sea level was still below its present level. From 1000 to 500 B.C. there occurred a series of

interrelated climatic, cultural and environmental changes. There was a cessation of marine transgression, climatic cooling, and hickory trees were replaced by chestnut and more northern flora (Dincauze 1974:49).

Common artifacts during the Late Archaic were projectile points, probably mounted on spears or javelins, atlatl weights, mortars and pestles (Casjens 1977:40). The Transitional period was most distinguished by the prevalence of stone (steatite) bowls and the first appearance of true pottery (hence, the term "transitional").

During the Late Archaic and the succeeding Transitional period, three cultural traditions existed: The Notched-Point Stylistic horizon, the Narrow-Stemmed tradition, and the Susquehanna or Broad-Bladed tradition. The Narrow-Stemmed tradition began shortly after the Notched-Point tradition and apparently coexisted with the Susquehanna, finally reappearing by itself in the Early Woodland.

As reflected by the artifacts and site locations, subsistence during this period involved a sophisticated utilization of almost every major microenvironment. The resident peoples apparently relied heavily on intensified hunting and gathering. The Boylston Street Fishweir (circa 2500 B.C.) suggests that alewives, shad and salmon were especially important resources (Dincauze and Meyer 1976:5). The later Susquehanna and Orient periods heavily utilized shellfish (Dincauze 1974:50, Turnbaugh 1975:60). Hunting and gathering also continued to be very important.

The Notched-Point tradition lasted from 2800 to 2200 B.C. Its most diagnostic artifacts are Brewerton and Vosburg points. Vosburg and Brewerton points, similar to the preceding Otter Creeks, grade into higher concentrations the further north they are found. Also, like the earlier Otter Creek phases, there appears to be no full fledged Laurentian cultures located in southern New England during this period (Dincauze 1976).

Beginning shortly after the earliest Vosburg and Brewerton manifestations are points and complexes of the Narrow-Stemmed tradition. The earliest of the known complexes is the Bear Swamp phase of southern New England, dating from 2600 to 2300 B.C. The Squibnocket complex, dating from circa 2100 B.C., was first recognized on Martha's Vineyard, but is also apparently found all over southern New England (Ritchie 1969a). Narrow stemmed points in general appear to have had their strongest concentrations in southern coastal regions (Casjens 1977:40). Ritchie (1969:219) argues that Narrow-Stemmed points diffused into New England from the west and southwest. Dincauze (1974:47, 48) has countered and contends that stylistic differences and use of local lithics, among other things, present a strong case in favor of local development.

Around 2000 B.C. artifacts of the Susquehanna or Broad-Bladed tradition first appeared. This tradition, in contrast to the Notched-

Point horizon, was concentrated on the coast and interior lowlands and appears to represent a sudden migration of population and/or influences from the southeast into New England (Turnbaugh 1975). These new cultures apparently intermingled and coexisted with resident Narrow-Stemmed populations (Dincauze 1974:49, Ritchie 1969a:219). Cook (1976) however has countered Turnbaugh's position and sees no clear cut evidence for a northern migration of Susquehanna groups.

Phases of this tradition are as follows: Atlantic phase (2000-1600 B.C.), Watertown phase (1600-1300 B.C.), Coburn phase (1300-1000 B.C.), and continuing into the Transitional period, the so-called "Hawes Group" (1000-600 B.C.).

The Atlantic phase was apparently confined to eastern southern New England while in the western part of southern New England various Snook Kill occupations are found (Dincauze 1975:27). The succeeding Watertown phase was apparently a period of wide trade networks as evidenced by the presence of exotic lithic material (Dincauze 1974:49). It was also a period in which cultural and social consolidation took place and the time at which steatite first became important (Dincauze 1975:27).

In the Coburn phase interior influences became stronger, regionalism asserted itself and the steatite industry flourished (Dincauze 1975:20). During this phase and the succeeding periods of the Hawes group and the Orient phase there was an apparent merger of the Narrow-Stemmed and Susquehanna traditions (Dincauze 1975:23, 24).

The Transitional period began about 1000 B.C. and is characterized by two "phases": the Orient and the Meadowood. Meadowood is closely related to Dincauze's Hawes group (Ritchie 1969a:222-223). Both of these phases date to about 1000-500 B.C.

Dincauze (1975:29-30) sees a continuum from the Coburn cultures to those of the Orient. Unifying trends are the merging of point styles, the persistence of the steatite industry and similarities in mortuary practices. Orient sites, like preceding Susquehanna sites, were also coastal in orientation, although some sites are found as far north as Sumner Falls, Vermont (Dincauze 1975:30). Dincauze (1972:50) maintains that all of the above enumerated phases and complexes, except for the Notched-Point, are ultimately derived from the "Atlantic Slope Macrotradition." This is a continuous cultural provenience running along the Eastern Seaboard which, through time, witnessed a series of waves of cultural innovations emanating from the Carolinas region. It should also be noted that from 3000 to 1600 B.C. in southern New England, lithics of all three traditions, Notched-Point, Narrow-Stemmed, and Broad-Bladed, were almost exclusively of local quartz or quartzite (Dincauze 1976:132, Swigart 1974:10). The preceding Otter Creek artifacts were often of ground stone, while the succeeding Watertown artifacts were of imported cherts (Dincauze 1972:59; Fitzhugh 1972:12).

In general for the Late Archaic, the following types of sites have been found: small open camps, large camps, quarry-workshops, rock-shelters and caves (Ritchie and Funk 1973:337-338). These people practiced central-based wandering and had a broad spectrum resource base (Dincauze 1975:24). Territories were centered on river basins (Dincauze 1974:48). Sites are present in all microenvironments, as might be expected in the case of high population densities. Among the most prominent locations are lakeside winter villages and estuaries (Dincauze 1974:48). Swigart (1977:71) comments that these people camped on, or hunted from, any suitable spot; regardless of the location of nearby water sources.

More specifically a number of statements have been made about settlement patterns of particular cultures. Ritchie and Funk (1973:339), speaking of the Narrow-Stemmed Lamoka culture of central New York, claim that most sites of this period are small, temporary camps found on large and small streams, lakes, and large marshes. Squibnocket sites in eastern Massachusetts are concentrated on the intertidal zone at the estuary head (Dincauze 1973:35). Atlantic phase sites indicate a restricted wandering pattern of small bands of family groups (Dincauze 1972:56).

Transitional sites have a wide dispersal pattern similar to Late Archaic sites, but there are fewer of them (Swigart 1977:71). Orient sites are of two types: camps and cemeteries, and they are heavily concentrated in coastal areas (Dincauze 1974:50, Ritchie and Funk 1973:334). Dincauze and Meyer (1976:5) postulate that from 1000 B.C. to A.D. 1, fewer people lived in the interior of New England, perhaps in response to climatic deterioration.

Dincauze (1974:48-49) has hypothesized that from the Narrow-Stemmed period through the Susquehanna times very large populations existed, but that with the onset of the Orient phase there was a decrease in population size. Casjens (1977:40) estimates that population density was equal to that of the Late Woodland, while Salwen (1975:54), referring to the Hudson Valley for the same period, estimates that population densities ranged from 100 to 125 people per km^2 in the interior.

Note should also be made of the prevalence of mortuary ceremonalism during the Late Archaic period. Bear Swamp 1, a Narrow-Stemmed Point site in eastern Massachusetts, dated to 2600 B.C., is the oldest cremation feature in southern New England (Dincauze 1975:28). Burial ceremonalism continued to be fairly elaborate among the succeeding Narrow-Stemmed and Susquehanna peoples, but it finally reached a peak with the Orient cultures of the first Millenium B.C. (Dincauze 1974:50, 1975:28). Dincauze (1975:28) has hypothesized that burial ceremonials were a ritualistic way of allowing interaction between members of diverse cultures, such as the peoples of the Narrow-Stemmed and Susquehanna cultures.

In northern New England during the Late Archaic period 3000-1500 B.C. there apparently coexisted two distinct, yet related cultural traditions. In Vermont and interior New Hampshire, the Laurentian continued to exist during the third Millenium and was typified by Brewerton and perhaps Vosburg points. (Fitzhugh 1972:10, Ritchie 1971). From about 3000 to 1500 B.C. the coastal areas of Maine and areas to the north were characterized by the Maritime Archaic tradition, which was related to Laurentian but was distinct in its adaptation to sea resources. (Tuck 1971:357). Also found in Maine and probably closely related to the Maritime Archaic tradition was the famous Red Paint or Moorehead Mortuary complex. These elaborate red ochre interments date from 3000 to 1500 B.C. with their peak florescence occurring from 2500 to 2000 B.C. (Fitzhugh 1972:13; Sanger 1973; Tuck 1971:348).

Fitzhugh (1972:13) and Tuck (1975:144) have hypothesized that the Maine-New Hampshire coastal area was an intense interaction sphere during this period. Fitzhugh (1972:12) postulates that the Moorehead Mortuary complex flourished at this time because it functioned to unite the diverse societies of the region. With the northward movement of Susquehanna complexes into northern New England about 1700 B.C., the Maritime Archaic and the Moorehead Burial Complexes declined and vanished from Maine around 1500 B.C. (Borque 1975:35, Fitzhugh 1975:4).

Woodland.

Early Woodland (800-200 B.C.). From 1000 to 500 B.C. cooler climatic conditions produced a decrease in local carrying capacity, especially in the interior. By A.D. 1 the area around the Neville site in New Hampshire had changed from an oak-hickory to an oak-chestnut forest (Dincauze 1976:130). Sea level for the last 3000 years had only risen gradually, averaging about three feet per 1000 years (Salwen 1975:55).

Few sites are known for this period and temporal boundaries between phases are poorly delineated. The primary diagnostic used to define the beginning of this period is the first appearance of true (fired clay) pottery known as Vinette I. This is a thick, grit-tempered, cord-marked pottery (Willey 1966:282). Also appearing for the first time are gorgets and blocked-end tubular smoking pipes (Casjens 1977:42). The earliest documented use of Vinette I in New England is on Martha's Vineyard where Ritchie (1969a:232) reports a date of no later than 590 B.C. Salwen (1975:55) states that sometime before 1000 B.C. ceramics were first in use on the Lower Hudson and Dragoo (1976:16) maintains that ceramics were first used in New England before 1000 B.C.

There appears to be general agreement that pottery, in and of itself, was not a revolutionary cultural innovation (e.g., Dincauze 1978:4). There does, however, appear to be a major debate as to whether other changes occurring at the same time were significant in changing the adaptive histories of resident populations. Ford (1974: 398) and Dragoo (1976:16) see no clear differences between the Archaic and the Early and Middle Woodland adaptive patterns. Fitting (1978:44) argues that a

quantitative change took place during this period, while Dincauze (1974:49) argues that by A.D. 1 a new pattern had evolved, and Snow (1978:60) believes that a major discontinuity occurs after 500 B.C. when the Susquehanna complexes are abruptly replaced by triangular points and ceramics.

Although corn entered the greater Northeast about 300 B.C. (Ford 1974:402) there is no evidence for it being in New York or New England until very late in the Middle Woodland. Ritchie (1959:189), however, has hypothesized that during the Meadowood chenopodium and Polygonum might have been intensively harvested for their seeds.

Most sites of the Early Woodland are located at estuary heads (Dincauze 1974:50). During this time it also appears that some of the inland areas continued to be abandoned (Casjens 1977:42). Overall, this appears to have been a period of low population density (Dincauze 1974:50-51). Sites of this period include open temporary camps, recurrent camps and cemeteries which are on terraces overlooking rivers and along the coast (Ibid:43).

Ritchie (1959:189) makes the interesting hypothesis that with the appearance of storage pits during Meadowood times, greater seasonal stability was achieved. Meadowood also shows evidence of the beginning of social stratification and continues the heavy emphasis on ritual seen in the Orient Phase (Ritchie and Funk 1973:349, 354).

Middle Woodland (200 B.C. - A.D. 900). During this period essentially modern climatic and biotic conditions were achieved. Fitting (1978:44), however, notes that a number of Middle Woodland sites were probably inundated by rising sea levels. Ritchie (1969a:225-226) notes that Middle Woodland sites are "extremely scanty" in southern New England (see also Dincauze 1974:51).

Appearing for the first time during this period are the straight pipe, the elbow pipe, the platform pipe and possibly the bow and arrow (Casjens 1977:43; Ritchie and Funk 1973:117). The most diagnostic artifact is Vinette II pottery of the Point Peninsula tradition (Ritchie 1959:206). "The Vinette II ceramics comprise a multiplicity of decorative techniques, mainly dentate stamping, rocker-stamping, pseudo-scallop shell stamping, and cord-stick ornamentation" (Ritchie and Funk 1973:117).

In New York the earliest Vinette II pottery dates from 668-519 B.C. (Ritchie 1969:207), while in New England the earliest Vinette II occurs on Martha's Vineyard and is dated about 360 B.C. (Ritchie 1969a:232). On the coast of Connecticut, at the same time, pottery with similar attributes was being produced. In this area it is classified as Windsor tradition (Rouse 1947:23; Smith 1950). Around A.D. 1 the first pottery appeared in northeastern New England. These wares are similar to those of the Point Penninsula tradition (Sanger 1971:2).

Early Middle Woodland points appear to be extremely scanty but include Rossville and other Narrow-Stemmed varieties (Dincauze 1975:131; Swigart 1977:71). These artifacts date sometime before 200 B.C. and continue up to about A.D. 400. Unfortunately no clear assemblages have been defined for this period in New England.

Late Middle Woodland points date from A.D. 400 to 900 and include in southern New England Jack's Reef, Steubenville (now Fox Creek), Greene, and possibly some Levanna points (Ritchie 1959a:226). The two most common point types apparently were Fox Creek (A.D. 400-700) followed by Jack's Reef (A.D. 700-900). The Middle Woodland probably was the period in which beans and squash were becoming incorporated into the subsistence activities of the local populations (Dincauze 1974:51). Hunting and gathering still remained important and Ritchie (1969a:227) points out that fish and shellfish continued to be heavily exploited. There is general support for a population decline during the first millennium A.D. (Ford 1974:53).

In the Northeast during this period the following types of sites are found: large camps, small camps, cemeteries, burial mounds, and workshops (Ritchie and Funk 1973:349). Most large sites are found on tidewaters (Ford 1974:400). Casjens (1977:53) states that at this time there was little use of the back country. It is likely that during the Early and Middle Woodland, local groups practiced a form of "restricted wandering" (Ritchie and Funk 1973:35).

Late Woodland (A.D. 900-1500). On the basis of pollen evidence, Salwen (1975:55) postulates that by A.D. 1000 and A.D. 1500, significant forest destruction appears to have occurred in central New York and on Cape Cod, Massachusetts. This destruction, he argues, is good evidence of the large scale application of slash and burn land clearing operations by the local horticultural villagers. The fact that the Roundtop Site in central New York, a large village-horticultural field complex, dates at A.D. 1070 helps to support Salwen's interpretation (Ibid: 56).

It is estimated that by A.D. 1100, corn, and probably beans and squash, were being raised in southern New England (Dincauze and Myers 1976:6). By A.D. 1600 horticultural practices had apparently spread as far north as coastal Maine (Snow 1978:58). Based on their documented importance in the Ethnohistoric period, it is clear that hunting, gathering, and fishing continued to be very important during the Late Woodland. It is in this sense that the Late Woodland has been termed "the culmination of forest efficiency" (Ford 1974:403).

In general terms Dincauze (1976:131) has commented on the Late Woodland as a period of "bewildering diversity." Nowhere is this clearer than in ceramics where our knowledge of the subject is so fragmented and the subject so complex that at this time even recognizing types is difficult (Ibid).

Generally five traditions of pottery are recognized in New England; these include Owasco, Iroquoian, Windsor, East River, and Guida (Byers and Rouse 1960:14-23; Dincauze 1975a:11; Young 1959:38). In addition, in Rhode Island and eastern Massachusetts pottery was being manufactured which could be grouped within a smoothed body tradition (Dincauze 1975a:11).

Generally there are certain attributes which serve to unite most ceramic types of this period even if they are from differing traditions. Most pottery of this period is shell tempered, although grit tempered pottery does continue (Ritchie 1969a:228). Furthermore, the shell tempering tends to be finer than that of the Middle Woodland. Sherds decorated with cordwrapped stick impressions or with incised hatchures, and parallel lines are probably from this period (Dincauze 1976:131). Salwen (1959:64) comments that throughout New England all Late Woodland pottery is alike in that it is collared, sometimes castellated, has a smooth surface, and a globular or semi-globular body.

Matters are extremely simplified when it comes to point styles: Levanna and Madison points comprise the only point types from A.D. 900 onward.

Based on the large number of sites and artifacts, it appears that population during the Late Woodland once again reached levels at least comparable to that of the Late Archaic (Ritchie 1969, Salwen 1975, Swigart 1974:23). Because of increased population and competition for suitable horticultural fields, both Salwen (1975) and Thomas (1978:23) suggest that central New York and the coastal lowlands of New England experienced increased warfare and stress during the Late Woodland period.

In coastal New York and New England, a variety of sites were utilized including shell middens, rockshelters, large agricultural villages, cemeteries, stockaded villages, camp sites, and quarries (Casjens 1977:53; Ritchie and Funk 1973:177). For agricultural and defensive purposes "high ground above major flood plains was at a premium for settlement locations" (Casjens 1977:44).

Indian Ethnohistoric Period (1520 to 1680)

This is the period of Indian history spanning the 160 years between first direct European contact to the almost complete annihilation and dispersal of native groups in southern New England, prior to, and following, King Phillips' War. This time span can be further divided into three subperiods based on the intensity with which these native societies interacted with the Europeans: Intermittent Contact (1520-1620), Symbiotic Interaction (1620-1643), and Political and Cultural Decline (1643-1680).

The period of Intermittent Contact began around 1520 when European fishermen fishing off the Grand Banks of Newfoundland established fish drying stations on the coasts south of Labrador and Nova Scotia (Basser

1978:79). In 1524, when Verrazano sailed along the New England coast, he noted plates of wrought copper being used by the local Indians; which were probably European trade items (Willoughby 1935:231).

Because the center of fishing operations remained in the Grand Banks - St. Lawrence area throughout the sixteenth century, and because the fur trade did not achieve major proportions until the last two decades of that century, European contact with the New England Indians was probably brief and infrequent during most of the century. Bereton in 1602 reported that he saw a large amount of copper and brass among the coastal Indians of Massachusetts (Willoughby 1935:231). Brasser (1978:86), however, cautions that even as late as 1608 the stone axe was in general use in southeastern New England. This implies that although trade with the Europeans, or Indian middlemen, might have increased in intensity, it was not significant enough to fill the presumed demand of the local population. During the first two decades of the seventeenth Century, and in response to a rapid increase in European demand for furs, the exploration and exploitation of the New England coastal areas increased in intensity. The Dutch in 1614 established posts on the Connecticut and Hudson rivers and in the same year John Smith traded for furs as he traveled down the New England coast. When the Pilgrims arrived at Plymouth in 1620, it is significant that both they and their Indian neighbors were already well aware of the mechanisms and possibilities of the trades.

The second period, Symbiotic Interaction, lasted from 1620 to 1643. This was a period when the newly settled English communities interacted with the local Indian population in a mutually beneficial manner (Brasser 1978:73). The Europeans, who were small in numbers, possessed trade goods and a new technology which the Indians desired. On the other hand, the Indians held the land and provided the fledging colonists with knowledge of the environment and labor needed to carry out the fur trade. This was also the period in which the native societies became disrupted because of increased warfare (for example, the Peguot War of 1637), epidemics (1615-1619, 1635), land dispossession, and internal power struggles. Because of increasing dependence on European trade goods, the local Indian societies became progressively embroiled in inter-colonial political rivalries and dependent on the European market system.

The third period, Political and Cultural Decline, began in the 1640s. By this time the local fur trade was in decline due to overexploitation. In addition, Europeans, who now equaled the Indians in population, were becoming more aggressive in their designs upon Indian agricultural lands. The Indians, who were previously courted because of their economic importance and military might, were now disregarded or viewed as expendable (Brasser 1971:73; Jennings 1975). Representative of the decline of Indian independence during this time was the Narragansett's admission of the superiority of the Christian God in the 1640's (Vaughn 1965:61), and the establishment of the first "Praying Indian" town at Natick, Massachusetts in 1651.

During the 1660s the Mohawk wars with the Mahican, Squakheags, Pennacooks, and Wabnacki illustrate both the widening of disruptions produced by the fur trade and the inter-colonial rivalries which, to a great extent, influenced the course of these conflicts.

King Phillip's War of 1675-1676, led by Phillip of the Wamponoag and Cahoncet of the Narragansett, caused much destruction of European property and life and resulted in the virtual extinction of the Narragansett as a people. Even more clearly this war illustrated the fact that the southern New England Indian groups had become clients and pawns of the struggling New England colonial powers (Jennings 1975). In retrospect, although King Phillip's War had important short term effects, in fact, it represents the last gasp of independence by the already severely weakened Native American societies of the region.

Technology and Subsistence.

From 1520 to 1680 the New England Indians continued to practice the same mixed horticultural and hunting-gathering-fishing subsistence economy which had characterized the Late Woodland period. Up to 1620s the essentially Late Woodland stone-wood-bone-clay technology continued to function almost unchanged. After this time European tools and trade goods, especially metal axes, knives, arrowheads, cooking vessels and guns became of increasing importance to the Indian tool inventory.

It is still an open debate as to what effects this new technology had on time spent in labor or on work efficiency. For instance, it can be argued that there really was little overall effect because the new tools and goods were still primarily powered by human mechanical energy and so were not a qualitative advance in energy capture. However, it is clear that no matter what the actual benefits of the new technology, the Indians became dependent on these imported manufactures and hence, more at the mercy of forces which were beyond their control.

In terms of division of labor, Indian men and women as a rule performed very different activities. Men hunted, fished, traded, negotiated and made war. Women gathered, made pottery, planted, maintained and harvested the crops and raised the children. Both men and women worked together to clear the land (Salwen 1978:163).

Hunting was very important in supplying the nutritional needs of the Indians. Deer was the most important meat source, followed by moose (Rainey 1936:13, Warner 1972:30). Numerous other medium to small size mammals, as well as wild turkey and migratory birds, were exploited.

Sea mammals, such as whales and seals, were important along the coasts. Crustaceans and shellfish were also extensively collected. In Rhode Island shellfish collecting continued throughout the winter (Salwen 1978:162). Fish of all types were utilized, but especially important were the large numbers of anadromous fish which made spawning runs up many of the New England rivers in the spring. The most important of

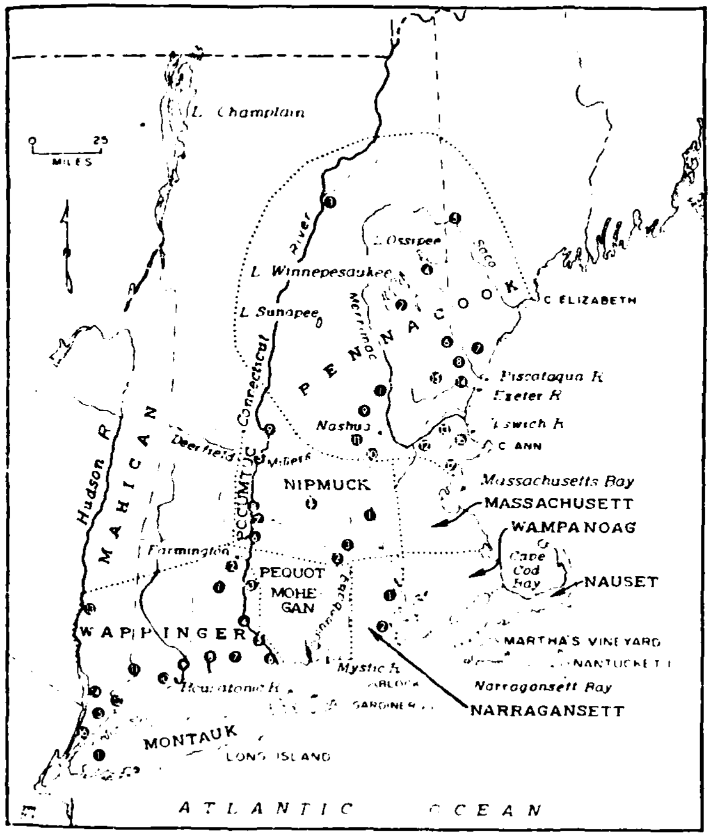
these species were sturgeon, shad, alewives, salmon, and lamprey (Rainey 1936:17, Salwen 1978:162). Weirs for catching these species were located in most of the large rivers in the region (Johnson 1942; Meyers 1970:18; Rainey 1936).

Women gathered shellfish as well as wild nuts, plant foods, berries, and roots. Hemp was collected for nets, line, ropes, and twined baskets. Maple sugaring was done in the spring. It was an important native industry along the Housatonic River (Rainey 1936:19). Maize, kidney beans and squash were the three main domesticated crops grown by the Indians of New England. Pumpkins and tobacco were also cultivated. Maize was by far the most important domesticate. Bennett (1955:394) estimates that maize could have provided 68% of the daily individual caloric intake. Roger Williams reported that an Indian woman could raise 24 to 60 bushels of maize a year (Rainey 1936:12). The importance of maize is attested to by the large amount of cleared acreage either in crop or abandoned that was noted by such observers as Champlain for the Kennebec River and Cape Ann, and by Bradford for the Boston Islands (Thomas 1976:6, Willoughby 1927:128). Maize was concentrated along the coastal sections of New England as far north as the Kennebec River and up the Connecticut River as far north as southern Vermont (Thomas 1976:7, 1978:19).

Cultural and Political Groupings

Although all of the aboriginal groups in New England spoke Algonquian, there is unanimous agreement that southern New England during this period was a distinct cultural province from northern New England. The dividing line has alternately been drawn at Cape Ann (Willoughby 1935:276), the Merrimack River (Rainey 1936:3) or the Saco River (Flannery 1939:192, Salwen 1978:160). Flannery (1939:191) bases her geographic distinction on a tabulation of cultural traits, while Salwen (1978:160) emphasizes the "abrupt" linguistic break between southern New England and Western Abenaki languages. There appears to be general agreement that there is considerable cultural affinity between groups in southern New England and eastern Long Island. The Housatonic River in western Connecticut seems to define a cultural boundary between cultures of New York and New Jersey and those of New England (Salwen 1978:160). Tribal groupings, although somewhat congruent with cultural boundaries and natural physiography, were often the reflection of political alliances of one group with another, usually through the person of the respective sachems of the groups in question (see figure IV-1).

Following Cook (1976:84); Day (1978:152-153); Salwen (1978:169-173); Snow (1978a); and Vaughan (1965:51-57); the following chart summarizes political units, populations, and geographic distribution of New England Indian groups about 1610.



KEY TO MAP

MAJOR TRIBES, SUBTRIBES, AND CENTERS OF POPULATION ABOUT 1630

PENNACOOK CONFEDERACY

1. Pennacook proper
2. Winnepesaukee
3. Coosuc
4. Ossipee
5. Pequaket
6. Newichawanoc
7. Accominta
8. Piscatequa
9. Souhegan
10. Nashua
11. Wachusett
12. Wamesit
13. Pentucket
14. Squamscot
15. Winnecowet
16. Agawam
17. Naumkeag

NARRAGANSETT

1. Shawomet
2. Narragansett

WAPPINGER CONFEDERACY

1. Tunxis
2. Poquonnoc - Massoco - Sicaog
3. Podunk
4. Mattabesec proper
5. Wongunk
6. Hammonasset
7. Menunketuck
8. Quinnipiack
9. Paugusset
10. Uncowa
11. Tankiteke
12. Siwanoy
13. Sint-sink - Kitchawanc
14. Nochpeem - Wappinger proper
15. Weckquaesgeek
16. Manhattan

LONG ISLAND

1. Canarsee Montauk

NIPMUCK POCUMTUC

1. Nipmuck proper
2. Wabiquasset
3. Quinnebaug
4. Quaboag
5. Pocumtuc proper
6. Agawam
7. Shipmuck
8. Nonotuck - Norwottuc - Waranoke
9. Squawkeag

MASSACHUSETT

WAMPANOAG

NAUSET

MOHEGAN - PEQUOT

MAHICAN

(from Cook 1976:2-3)

Figure IV-1

Tribal Group	Population	Location
Wabanaki	15000	Maine, New Hampshire, Vermont
Pawtuket (or Pennacook)	12000	New Hampshire and Massachusetts
Massachusetts	4500	Massachusetts Bay
Pokanoket (or Wampanoag)	5000	Plymouth County and nearby
Nauset and the Islands	8000	Cape Cod and the Islands
Narragansett	7800	Rhode Island
Pequot-Mohegan	3500	Eastern Connecticut
Nipmuck-River Indians	5300	Connecticut River Valley, interior Massachusetts
Wappinger and other western Connecticut groups	13200	Western Connecticut

TABLE 8: Populations of Selected Indian Groups in New England circa A.D. 1610

Political and Social Structures

Southern New England Indian societies were fairly egalitarian but they also showed some degree of nascent class stratification (Brasser 1971:66, 1974:9). It is currently unclear whether the differences in rank observed in the seventeenth Century was mostly aboriginal in nature or if the disruptions of European contact heightened existing status differences. Each of the major Indian groups or tribes in southern New England was headed by a paramount chief or sachem (sagamore). This individual was usually a member of a chiefly lineage. The chief's function was to redistribute surpluses, adjudicate disputes, wage war, and engage in diplomacy. Below this individual were a number of subchiefs who headed smaller political or kinship units such as subtribes, lineages, clans and villages. Although some evidence could lead to the conclusion that sachems often ruled despotically (Willoughby 1927:133), there are an equal number of instances which can be used to argue that chiefs were fairly limited in authority; if not formally, at least by circumstances. In the first place, custom dictated that a wise ruler seek the advice of counselors and esteemed tribal members. In the second place, if a sachem too often, or too brazenly, behaved in an unpopular fashion, the possibility existed that another member of the chiefly lineage would revolt and overthrow him. The third possibility is that dissatisfied individuals would merely move, or put themselves under the protection of a less tyrannical authority.

Willoughby (1935:278) argues that most of the southern New England tribes were matrilineal in descent, Vaughan (1965:33) believes that most were patrilineal, while Lorraine Williams (Williams 1972) states that most of these groups were probably matrilineal before European contact, but that this system broke down after contact. Simmons (1978:193) states that for the Narragansett, the situation is unclear but there seems to be some evidence which indicates that they once had exogamous, matrilineal clans. Salwen (1978:167) states that the chiefly lineages in this area

seemed to have a patrilineal bias, although he also notes that there are instances recorded in which squaw sachems ruled. Polygamy was also present but practiced mainly in the chiefly lineages (Salwen 1978:167). In regard to the antiquity of large scale political units, it has been suggested that after contact latent political ties of what were previously smaller scale groups were strengthened as they combined into confederacies or tribes as the result of increased competition (Brasser 1971:68). Salwen (1978:168) postulates that the new epidemics which New England groups experienced in the seventeenth century might have led to the strengthening of existing political alliances.

Population History

Thomas (1978:23) estimates that in the mid-sixteenth century southern New England had at least 90,000 inhabitants. Mooney (1928), however, was much more conservative and estimated that in 1600 New England had only 25,000 inhabitants (see also Meyer 1979). Cook (1976:84), reflecting more recent views, estimates that in 1610 New England had at least 70,880 Indians. Brasser (1978) estimates that population densities in horticultural areas (southern New England) were 45 persons per square kilometer, while in Nova Scotia densities fell to three persons per square kilometer. As a general rule the most densely populated sections of New England were the lowlands and river valleys (Brasser 1971:65). Rhode Island, especially, had a high population concentration (Rainey 1936:10).

With all the debate over demography, all the authorities agree that various epidemics reported for 1615-1619, 1633-1643, and 1675, significantly reduced the aboriginal population. Vaughan (1965:28), for instance, argues that the epidemics of 1615-1619 wiped out at least two thirds of the Indian population of New England. He estimates that the Massachusetts Indians, located around Massachusetts Bay, were among the hardest hit and were reduced from 3000 in 1615 to 500 in 1630 (Ibid:54).

Other causes of Indian population reduction in New England were flight or emigration to other colonies or areas, enslavement and shipment to other colonies (as was the case after the Pequot War), and death from combat. Edmund Randolph, writing in 1676 estimates that the Narragansett experienced about 3000 casualties in King Phillip's War while Vaughan (1965:320) estimates that 5000 Narragansett dead might be too excessive a figure. Jennings (1975:29) thinks that in 1674 there were about 9000 Indians remaining in Southern New England; while Brasser (1971:73) estimates that by 1680, southern and central New England native population had been reduced to 14,000 individuals.

Settlement Systems

Sites from the Ethnohistoric period include agricultural villages (palisaded and unpalisaded), hamlets, fishing camps, hunting camps, quarries and trading camps which could be palisaded (forts) or unpalisaded (Casjens 1977:53; Salwen 1978:66; Willoughby 1927:134).

Areas used and exploited by the native groups were shellfish harvesting areas, wampum production sites, agricultural fields along major rivers and tidal streams, wild plant collecting areas, marshes (for fowling and refuge during war), and deer hunting territories (Brasser 1971:64; Ceci 1977; Salwen 1978:164).

The agricultural village was the basic unit; it was "a social unit utilizing the resources of a limited territory, usually part of a drainage system or a section of the coastal plain" (Salwen 1978:164). In the seventeenth century Indian villages in the Connecticut Valley were spaced about 40 kilometers apart and might have exhibited a dual settlement system of small hamlets occupied by extended families surrounding the centrally located village site (Thomas 1978:32).

Palisaded forts (trading posts and/or agricultural villages) were also very common during this period. Willoughby (1935:284) estimates that about 20 forts were reported existing from 1605 to 1676 in New England. Thomas (1978:23) postulates that forts represented consolidation of communities for defensive purposes after the mid-sixteenth century. Aboriginal social and residential units were, in general, very small. A typical territory consisted of land around a river system surrounded by watersheds and a fall line or seashore (Braser 1971:65).

Thomas (1976:9-10, 1978:21) has done extensive research in order to reconstruct the year round subsistence patterns of the Connecticut Valley Indian. This cycle might be considered fairly typical of most inland groups in southern New England:

Early Spring - Large spawning runs of alewive and shad, followed by salmon runs, caused families to gather by one of the large falls which are often located at the Fall Line. In northern areas maple sap was gathered and processed.

Spring - Corn fields were prepared, seeds planted, fishing probably continued, some hunting.

Early Summer - Families were attending family plots, there was some fishing and hunting.

Summer - Women gathered wild plants and herbs and processed fiber for basketmaking. This was a time of great ceremonial activity.

Early Fall - Collection, drying, and storage of horticultural products, nuts and berries.

Fall, Early Winter - Hunting took place. The elderly and young children remained in the villages, or single families established hunting lodges.

Winter - Villages were again heavily populated. Stored foods were heavily relied on. Local hunting took place, particularly of moose. Also winter ice fishing was pursued.

After February - Large spawning runs of alewive and shad occurred again.

There is some evidence that certain well-favored coastal areas, such as Rhode Island, were areas of year round residency. (Salwen 1978:162). People in these areas would, of course, have been required to move a lot less than populations in more inland regions. In general, however, during the spring and summer Indian populations of southern New England would be on the coast fishing and shellfishing, while during the fall and winter they would be inland along rivers and ponds (Rainey 1936:13, Warner 1972:43, Salwen 1978:162). Salwen (1978:162, 164-165) summarizes population distributions through the seasons as follows: in the summer, population was most concentrated; in the fall, populations began to move inland to hunt; by the winter, populations were deep in the upper reaches of the forest; and in spring, in response to the fish runs, large multi-village gatherings took place.

In northern New England, during the early colonial period, the Wabanacki spent the winter upstream hunting in small bands. The summer was spent on the lower courses of the major streams and/or on the coast, fishing and gathering shellfish (Snow 1968:1148).

Historic Period

Initial Exploration (1497-1620)

Fxcepting the Norse settlement complete with bog-ore smithy at L'Anse aux Meadows in Newfoundland, dating to circa A.D. 1000 (Ingstad 1977; H. Ingstad 1964:708), and a Norse lumbering camp on the coast of Labrador in the fourteenth century (see Brasser 1978:79), the earliest named European to have visited the northeastern coast of North America was Cabot in 1497, and possibly 1498. In 1500 and 1501 the Portuguese Gaspar Corete-Real explored the coast of Newfoundland. Around this time, or even somewhat before (see Witthoft 1967:56), English, Basque, Norman, Breton, and Portuguese fishermen were fishing off the Newfoundland coast. Incidental to the fishing operations, the fur trade began sometime before 1519 as the fishermen put ashore on the coast to dry their fish before returning to Europe. (Brasser 1978:80). In 1524 Verrazano sailed along the Southern New England coast entering Narragansett Bay and possibly New York Harbor. In 1525 Gomez sailed up the Penobscot River. In the 1530s and 1541 Cartier became the first European to penetrate the interior by means of the St. Lawrence River. Following Cartier there was an interlude in exploration, but apparently not in fishing. In 1550, 30 French ships and 30 ships of other nations were reported to be visiting Newfoundland annually. By 1578 it was estimated that about 400 ships a year (50 English, 150 French, 100

Spanish, 100 others) were fishing the Grand Banks (Brasser 1978:79). By 1600 English ships alone numbered 200 (Fite and Reese 1965:74).

Newfoundland's economic importance at this time is illustrated by the fact that in 1583 Gilbert contemplated establishing in Newfoundland the first permanent English colony in North America. However, it was not until 24 years later, in 1607, the same year that Jamestown was successfully established in Virginia, that Popham and Gilbert attempted the first English Colony in the Northeast. The colony was located at the north of the Kennebec River in Maine, but lasted only one year. Meanwhile to the south, exploration had progressed with Gosnold exploring Cape Cod in 1602. Pring, in the same year, landed in eastern Massachusetts and took soil samples to test the suitability of the area for European crops. In 1605, while Wymouth, the Englishman, was sighting Nantucket, Champlain was sailing along the east coast of New England from his base on the St. Lawrence. In 1607 Champlain produced the first surviving accurate map of the region. In 1614 John Smith, sailing along the New England coast to evaluate its resources, made a fairly detailed and accurate map of the area and first named the region New England. In the same year the Dutchman Adrian Block, sailing from New York, explored and mapped the southern New England coast and sailed up the Connecticut River. Thus, when the Pilgrims arrived at Plymouth Bay in 1620 after briefly touching on Cape Cod, the general outlines of New England geography were already fairly well know (they had in fact consulted with Smith in England before their departure).

Sites of this period were very small and impermanent, and as a result are hard to locate. Fish drying stations and fur trade rendezvous points were located on coastal areas. Fur trading posts were also located on the lower reaches of major inland rivers.

Colonial Settlement (1620-1790)

This period began with the landing of the Pilgrims in Plymouth in 1620 and ends with the establishment of the United States Constitution in 1789. The year 1690 will be used as a convenient date which separates the period during which the basic settlement pattern was established from the period in which this pattern was elaborated and somewhat altered.

Political Events and Settlement History (1620-1690)

Despite the fact that their settlement was not legally recognized, the Pilgrims decided to remain at Plymouth and drew up the famous Mayflower Compact which stated that the colony was to be established as an autonomous, representative government. Of the original one hundred Mayflower passengers of 1620, more than half were dead by the next winter due to the extremely harsh conditions (McManis 1975:30). Nevertheless, with the assistance of the neighboring Indians, particularly the Wampanoag, these settlers, reinforced by new arrivals, became the nucleus for the first significant European settlement in New England. It is significant that in the same year Sir Fernando Gorges formed a closed

joint stock company in England to colonize the New Hampshire and Maine areas. In 1622 Gorges and John Mason obtained land grants from the British Crown covering the area between the Merrimack and Kennebec Rivers. They formed the "Company of Laconia" composed of British merchants. Gorges eventually established himself in the modern area of Maine, while Mason located his settlers in the area of New Hampshire (Morison and Elting 1976:11). In the same year the Dutch established the colony of New Netherlands (New York). Also about this time the Dutch (who had already established a trade post at Albany in 1614) built a fort for the fur trade at the mouth of the Connecticut River.

Three locational attributes which were especially important for settlement placement were: (1) an adequate water supply, (2) good anchorage, and (3) enough open ground for planting (Moran 1978:13). Another factor, especially important before 1676 in southern New England, was the absence of a significant resident Indian population; for such groups would naturally oppose large scale migration into their territory.

Given these factors, almost every major European settlement in seventeenth century New England is located along the coast or on the lower reaches of the major navigable rivers. In 1627, 1629, and 1633 the Pilgrims established fur trading posts on Cape Cod, on the Kennebec River, and on the Connecticut River. These early ventures illustrate the importance which the trade held to the economic well-being of the community.

In 1629 Plymouth was legally chartered by the Crown. In the same year a royal charter was granted to a group of Puritans to establish the colony of Massachusetts Bay. The initial group arrived and established themselves in seven towns surrounding what was later to become the city of Boston. Thus in 1630 there were approximately 2300 Europeans in New England concentrated in three areas of settlement: (1) approximately 1000 were clustered around Massachusetts Bay; (2) about 500 were at Plymouth Plantation and (3) about 900 individuals were scattered along the New Hampshire and Maine coast, with some concentration along the Piscataqua River (McManis 1975:42-43, 68-69). From 1630 to 1640, in response to political and religious persecution, the "Great Migration" from England to Massachusetts Bay took place. Thus by 1649 the total population of New England increased by 550% to 13,700 individuals (McManis 1975:68). Massachusetts Bay had a population of 9000; Plymouth 1000; Connecticut (settled in 1636), 1500; Rhode Island (settled in 1636) 300; New Hampshire 1,000; and Maine 900. (McManis 1975:68).

Barton suggested that "the unit of settlement in the seventeenth century was a group of families, often belonging to the same church" (Barton 1977:105). Settlements of this period were organized by the famous New England "town system." This system worked as follows: A group of settlers interested in founding a new town would apply to the General Court, which would grant or deny permission for the planned move or the political sub-divisioning (if an old town was divided up). If permission was granted, settlers established a village center, in which

the town meeting house, the church, a schoolhouse, some mills, dwellings and perhaps a few shops (for example, blacksmith, cooper) were constructed, surrounded by agricultural fields. During this period, the Court declared that it would not allow any dwellings to be established any great distance from the town centers (Weeden 1891:73). This was ordered because it was felt that a dispersed pattern would not provide needed security against possible attack. It might be added that dispersal would decrease the group solidarity which was an important part of the New England political ideology.

After a brief experiment with communal production (to 1623 in Plymouth), land was distributed to individuals on the basis of their investment in the project and on their ability to use the land (Fite and Reese 1965:31). All of the community families received equal access to the different ecological zones (for example, lowlands, uplands, swamps) while the village, as a corporate unit, maintained a communal meadow. However, after a generation or two and as population increased, and Indian threats decreased, two trends asserted themselves: first, the size of towns decreased as the originally large tracts became subdivided in response to population increase. Second, because of their inefficiency, scattered tracts formerly farmed from the village center were consolidated and dwellings were constructed on the consolidated holdings. This produced a pattern of scattered farmsteads surrounding an aggregated, older collection of dwellings and service buildings. Thus, "the Common Field System is distinctly seventeenth century being almost non-existent in the eighteenth century" (Barton 1977:106).

During the Civil War in England during the 1640s and 1650s New England was left relatively isolated. Massachusetts Bay and Connecticut (with respective populations of 14,000 and 8000 in 1650 (McManis 1975:68), became more independent and aggressive in their dealings with local Indians and with other colonists (Jennings 1975). Settlements were still primarily located along the coast, although some penetration of the middle reaches of the rivers (especially the Connecticut River) was achieved. In 1662 the newly restored monarch granted Connecticut its charter and in the same year the colony of New Haven was merged with Connecticut. In 1663 the monarch granted Rhode Island its charter. In 1664 New Netherlands was seized by the English and became the colony of New York. From 1675 to 1676 King Phillip's War raged in New England. It produced heavy losses on each side. Many of the newly settled areas, especially the northern ones, were abandoned and many of the older settlements returned to a more nucleated and defensive pattern.

New England population in 1670 had been 52,000, but ten years later had increased to only 68,000. By 1690 it had increased to 87,000 (McManis 1975:68). The significant historic events of this period are: (1) the purchase of Maine by Massachusetts Bay in 1677, (2) the granting of Royal status to New Hampshire in 1679, and (3) the transformation of Massachusetts Bay into a Royal Colony after the revocation of the Massachusetts Bay Charter in 1684.

McManis maintains that even before 1660 a "hinterland" pattern of trade had developed centered around Boston (1975:108). In this system Boston, as a large entrepot, received English imports, which were then distributed to the surrounding countryside. In turn, the surrounding rural villages sent their products to Boston, from which they were exported for foreign and intercolonial trade (Ibid). By the late seventeenth century the "emergent urban settlement model" was established (Moran 1978:13). In the core of this system commercial establishments were located surrounded by service enterprises. Around this belt was a residential area, which in turn was surrounded by agricultural facilities (Ibid). By the last few decades of the seventennth century six major loci of European settlement had been established: Massachusetts Bay, Plymouth and Rhode Island were separate nodes, but were already merging together, while coastal New Hampshire-Maine, the Connecticut River Valley and the New Haven area were still fairly discrete clusters (McManis 1975:48).

Political Events and Settlement History (1690-1790)

From 1689 to 1763 England and, by extension her colonies, were at war with France. The series of wars which occurred in North America were known as King William's War (1689-1697), Queen Anne's War (1702-1713), King George's War (1744-1748) and the French and Indian War (1754-1763). New England and other North American colonies contributed resources and men to the final defeat of the French in Canada. After the English victory strains developed between England and the American colonies. England, having defeated the French, now turned its attention to a more vigorous enforcement of mercantilist policy which was especially detrimental to the New England merchant class. The American War of Independence of 1775-1783 was at least partially a result of Britain's mercantile program. After a brief and ineffectual Confederation, the Constitution was adopted in 1789 and the United States government began to function the following year.

Southern New England was more or less spared the agonies of Indian raids during this period, although occasional forays such as the Deerfield Massacre of 1704 did occur. The constant threat from the north of raids from the French and later the British and their Indian allies, did much to retard exploitation and settlement of northern New England during this period. During times of war and threats there was also a tendency for settlement to recoil southward and eastward. Thus, even by the time of the Revolution, European settlement had not substantially penetrated north of the Fall Line. As a result of these military threats, a number of the new towns of the eighteenth century were located in frontier areas and functioned as defensive outposts, as well as diplomatic and trading centers (Barton 1977:108). With the breakdown of the communalistic ideology of the seventeenth century New England village, a new individualist secular ideology arose to gradually replace it (Lockridge 1970). The result was a tendency for the establishment of settlements composed of individual families attracted to settle by the efforts of land speculators and entrepreneurs. As a result, land

speculation became rampant in New England from the early to mid-eighteenth century finally peaking in the 1760s with a staggering increase in the number of new settlements. Some of these new towns often only had a few score families (Barton 1977:104). Population growth, in contrast to settlement expansion, was fairly constant during the eighteenth century. In 1700 there were 93,000 individuals in New England, in 1720-171,000, in 1740-289,000, in 1760-449,000, and in 1780-617,000 (McManis 1975:69). During this period the vast majority of settlers were in Massachusetts and Connecticut, although Rhode Island, given its size, was also extremely heavily populated. Boston throughout the seventeenth and early eighteenth century remained the most important commercial center in New England, but after 1769 Newport replaced Boston as the prime port, and it was in turn replaced by Providence by 1791 (Coleman 1963:65). Other ports in New England were becoming relatively more important.

Economic Developments (1620-1790)

Although some of these categories will cross-cut one another, the colonial economy may be broken down into the extractive industries (agricultural and non-agricultural), manufacturing industries, commercial enterprises, and service professions. Technological factors, population characteristics, and transportation and communication systems also are of obvious importance.

Extractive Industries: Non-Agricultural. The fur trade, as has already been indicated, was the crucial commercial enterprise for both Indians and Europeans in the early seventeenth century. Furs provided a highly profitable, easily obtainable commodity. Although some individuals made their living, or fortune, off the trade, many other settlers used the income derived from the furs to finance other economic activities or to pay off debts incurred in coming to the New World. After the mid-seventeenth century, with the local supplies of furs and population of Indians reduced, the fur trade moved north and west of southern New England.

For over a century before colonization, fishing off of the Grand Banks was economically very important. By the 1640s for the first time fishing from bases in New England became important. The more important species were cod, mackerel, haddock, and hake (McManis 1975:105). From 1670 to 1675 more than 600 New England vessels were employed in the trade, but these numbers rapidly declined from 1675 to 1713 when a severe depression hit the industry (Ibid). By 1731 fishing was again doing well when 5000 men were listed in the trade. Total catch in that year was over three million pounds of fish (Ibid:107). From 1765 to 1775, 4400 men and 665 ships are reported to have been engaged in the cod trade alone (Fite and Reese 1965:75). By 1775 Marblehead had become the center of the fishing industry employing 1000 men and 100 vessels (Morris 1951:65). Offshore whaling commenced in 1690 and had expanded tremendously by 1774 when the whaling fleet consisted of 360 ships, averaging 80 to 90 tons each. The two whaling centers at this time were

Nantucket and New Bedford (Bogart 1935:76, Fite and Reese 1965:75). Whale products included spermaceti (for candle making), sperm oil (for lighting), whale bone, and ambergris.

During the Colonial period there were four principal forest industries: lumber and lumber products; shipbuilding and ship timber; naval stores; and potash and pearlash (Bogart 1935:70-73). Wood, of course, provided the local New England populations with their main building material for structures, fences, furniture, and tools. It was also used as fuel for fires. Tree bark was used for tanning purposes. Lumber was also exported in large quantities to Europe which had a severe lumber shortage during and after the seventeenth century due to the demands of early Industrialism. In southern New England the lumber industry flourished until the mid-eighteenth century, at which time it went into rapid decline due to local overexploitation (Weeden 1891:503). Water powered sawmills were ubiquitous in their distribution during this period, appearing almost as soon, or even before, the local surrounding area was settled.

In 1631 and 1633 respectively, Medford and then Boston, Massachusetts each launched a ship thus beginning what was to become an important industry in New England. By the end of the seventeenth century four main foci of shipbuilding were in operation: Massachusetts Bay, the Piscataqua River, the Merrimack River, and Narragansett Bay (McManis 1975:11). During the early eighteenth century, the Massachusetts Bay shipyards are estimated to have launched about 140 ships annually. The same number was also launched in 1769. The largest purchaser was the British Merchant Marine (Fite and Reese 1965:103). By the mid-seventeenth century, it was a common sight to see large British vessels visiting the East Coast ports of New England in the mast trade (Weeden 1891:117). Prior to the mid-eighteenth century, the mast trade was centered in Portsmouth, New Hampshire, but because of the exhaustion of the white pine it moved progressively north to southern Maine and by 1776 to Bath and Machais in northern Maine (McManis 1975:121-122). Ship timbers and naval stores (pitch, tar, turpentine, and resin) were also in high demand for constructing and maintaining various naval vessels in Europe (Weeden 1891:581-582).

In 1643, 1646, and 1656 three iron works were established in eastern Massachusetts at Saugus, Braintree and Taunton. The iron produced at their sites originated in the local bog ore deposits. Although export had been originally contemplated, local demand was so great and production so low that very little was exported during the next century. (LeBlanc 1969:70). Because bog ore deposits are found primarily in southeastern Massachusetts this was where the iron industry was concentrated until the mid-eighteenth century (Ibid). By 1758 New England had 15 furnaces, 41 forges, and four slitting mills. These were located near the iron source areas. There were the bog ore deposits of southeastern Massachusetts and the more recently opened hematite deposits in western Massachusetts and Connecticut. (LeBlanc 1969:71-72).

Limestone kilns were also in operation throughout New England. Once the limestone was subjected to intense heat it produced lime which was much in demand for fertilizer and building mortar (Robinson 1976:108-109). More remote areas maintained local production; and larger scale production took place near urban centers (Ibid:111). Bricks, tiles, and pottery were all important colonial industries. All of these products depended on the availability of suitable clay deposits. As a result there was a strong correlation between locations of these operations and high grade clay deposits (Morris 1951:63).

Extractive Industries: Agricultural. By the early part of the eighteenth century, due to the low fertility of the soil and over-population, considerable population pressure was felt throughout New England (McManis 1975:00). As a result, during the eighteenth century it was not uncommon that even rugged hillsides were farmed (Robinson 1976:36). Morris (1951:51) argues that soil depletion occurred because of the detrimental effects of the "three field system" of crop rotation utilized by the colonists. In this system land was used until it was exhausted. Because of land exhaustion just prior to the Revolution there was a strong trend toward pastoralism and tree horticulture (McManis 1975:99, 111).

Maize was the most important crop throughout this period in New England. The second most important crop in the seventeenth century was wheat, while rye supplanted wheat in importance in the eighteenth century (Van Dusen 1961:111, McManis 1975:111). Corn was ubiquitous, while wheat was concentrated in the Connecticut Valley. In fact, wheat was initially so successful that it was exported abroad in large quantities. However, the devastating blight of the 1660s resulted in the rapid decrease in the importance of this crop (McManis 1975:91).

Other important crops throughout New England were oats, barley, peas and kitchen garden crops (McManis 1975:91). Tobacco became an extremely important commercial crop, especially in the Connecticut Valley, as early as 1640 (van Dusen 1961:111). Flax (for linen) and hemp (for rope) were also important locally grown plants. Orchards of various fruit trees were also important and apples in particular assumed major importance after 1700 when hard cider became the favorite alcoholic beverage in New England. As early as 1760, mulberry trees were introduced in an attempt to promote a native silk industry, but by 1840s a blight all but destroyed the industry (Van Dusen 1961:111).

Throughout New England the domesticated animals of importance were pigs, chickens, goats, oxen, cattle, horses, and sheep. Oxen in the early years were the prime draft animals. Rhode Island, because of its large meadowlands became an especially important horse-raising region. As a result, "Narragansett Pacers," the local horse breed, became famous for quality and an important item in the trade with the West Indies. Around the mid-seventeenth century sheep became an important economic resource (their number had increased to 3,000) and their wool became a regular item of trade (Weeden 1891:193). Cattle were first introduced in

1627 in Salem. At first both beef and dairy cattle were raised, but by the late 18th century, dairy cattling had becom a major emphasis of New England farming (McManis 1975:99).

Manufacturing. The Colonial period was characterized by two basic systems of production. The first of these was the household system which characterized New England from the earliest settlement and which persisted through the mid-nineteenth century in certain rural areas. The second of these was the putting-out system, which began in New England about the mid 1800s and lasted for a century (Morris 1951:74). The household system was basically a continuation of the medieval mode of production in which the residence of the workers (individual families) is also the workshop. Most of the product of this system of manufacturing is made either for the use of the producing family or for the consumption of neighboring families. The putting-out system involves a centralized shop which takes work orders and which acts as the location from which work and materials are distributed to surrounding individuals or households. Once this labor is completed, the shop acts as a collection point from which the completed product is then sold. Often, as in the shoe industry, the local population engaged in this type of labor only in their spare time or during periods of seasonal inactivity (for example, fishermen or farmers).

Most industries of this period were small scale and served either the immediate family or the local community. Spinning, weaving, cheese and butter making were often household industries; while more capital intensive industries, such as gristmilling, sawmilling, tanning, distilling, and brewing tended to be commercially oriented. Regardless of the scale of the industries, all of the above industries tended to be located throughout New England (McManis 1975:123).

Tanneries and distilleries were two industries which achieved large scale dimension both in economic importance and geographic range during the eighteenth century. The expansion of the leather industry as early as the mid-seventeenth century is illustrated by the fact that in 1653 there are reports that leather was being imported from the West Indies due to the shortage of hides in New England. After 1700 hides were being imported from Lisbon, the Azores, the Canaries, and South America (LeBlanc 1969:66). By the mid-eighteenth century, Boston had become the major hub of colonial tanning operations (LeBlanc 1969:66). Besides producing various domestic and farm items, large coastal tanneries fashioned the leather fittings which were crucial in the shipbuilding trade (McManis 1975:123).

By the first quarter of the eighteenth century rum became a crucial item in the triangular trade as described below as well as an important local commodity within New England (McManis 1975:132). The spectacular increase in the rum business is illustrated by a report that in 1769 alone, almost 3.9 million gallons of molasses and over 2.8 million gallons of rum were imported into the American Colonies (Bogart 1935:85). By the end of the eighteenth century it was not uncommon to

see scores of distilleries in many major New England ports (Coleman 1963).

Other industries and crafts to be found in New England, especially in the cities and larger towns and villages, were candle-making, paper-making, glazing, gold and silversmithing, lacemaking, and pewter making (McManis 1975:131-132).

Commercial Enterprises. Far and away the most important group of capitalists to emerge during the Colonial period in New England were the great merchants engaged in inter and intracolonial trade. This trade contributed significantly to the development of various coastal cities as centers of population and manufacturing. Throughout the Colonial period the bulk of products travelling between New England and Britain was carried by the British merchant marine. New England, however, quickly specialized in the intracolonial coastal trade and carrying trade in the Carribean which it dominated as early as 1677 (McManis 1975:108). The New England merchant marine eventually specialized in the so called "Triangular Trade" between New England, Africa, and the West Indies. In its simplest outline, New England merchants shipped rum which had been stored and/or distilled in New England to Africa, where the rum was exchanged for slaves. Then the slaves were shipped to the West Indies where they were exchanged for cotton, sugar, bills of exchange, rum, and especially molasses. These items were then shipped back to New England, from which the cycle again commenced. Trade in the New England interior, remote from navigable waterways, was carried on by means of itinerent craftsmen and the famous, far-wandering Yankee Peddlers (Bogart 1935:352-353).

Transportation and Communication. During the seventeenth and eighteenth centuries, roads were invariably very poor, badly maintained, and consisted primarily of a network of local routes connecting a town to various adjacent population centers. Thus, although a fairly complete road network existed in New England by 1740 (Fite and Reese 1965:63), costs and inconvenience of land travel were so high that most travel or transport took place, if at all possible, by water. Waterways were the main means of much local commerce and almost all long distant travel and trade. Inland, canoes and small boats were used. In the coastal trade, small sloops were used, while barks and other large ships were employed in the long distance trade. Because of these severe transportation limitations, town and industrial locations and general exploitation of the region during the Colonial period (and even up to the arrival of railroads) was dependent on the ease of access to a navigable body of water (see LeBlanc 1969).

Political Independence and Economic Maturation (1790-1930)

This period can be divided into two subperiods: Early Industrial (1790-1860) and Mature Industrial (1860-1930). The first period can be viewed as three-staged: From 1790-1810 there was a continuation of the Colonial pattern, from 1810-1840 there was a gradual economic development

and expansion, and from 1840 to 1860 there was rapid industrial growth (Fite and Reese 1965:208-209). The second period can be divided into late nineteenth and early twentieth century phases. The Spanish American War of 1898 can be viewed as a major turning point after which the United States became a leading overseas economic and political power.

Political and Economic Developments. In 1791, two years after the United States was established, Vermont was admitted as a state. The defeat of the Iroquois and the Louisiana Purchase of 1803 opened up the West for settlement. The result was that from 1790-1820 New England experienced a tremendous outmigration to New York and beyond. From 1807 to 1809 Jefferson's Embargo Act and later the War of 1812 severely dislocated New England's overseas commerce. In 1820 Maine became a state. In 1825 the Erie Canal opened and encouraged further western emigration as well as radically altering New England's agriculture. By 1840 the building and operation of railroads, coupled with the establishment of the modern factory system had dramatic and lasting effects on the history of New England (see below). The Civil War of 1861-1865 and its aftermath produced significant advances in technology and caused a rapid increase in the economic development of the Northeast. The Spanish-American War and even more conclusively, the First World War, definitely established America as a major international political and economic force. By this time the automobile was becoming a force which was to have as much impact on American social development as the railroad had half a century before. In 1929 the New York Stock Market crashed. This was followed by the Great Depression of the 1930's. Economic dislocation was felt in New England, as well as elsewhere.

Looking at the period 1790-1930, economists have noted cycles of economic boom (associated with inflation) followed by periods of contraction (recessions or depressions). Depending on the measure, or the purpose of analysis, the number of cycles can range from eight to a couple of dozen (Gordon 1978:26, Hansen in Samuelson 1973:154, Hunt and Sherman 1975:363). Hansen, basing his analysis on the period 1795 to 1937, states that the U.S. has experienced 17 major cycles (cited in Samuelson 1973:154). He asserts that "with a high degree of regularity every other major business boom coincides roughly with a boom in building construction, while the succeeding major cycle recovery is forced to back up against a building slump..." (Hansen 1973:154). This observation, if correct, might be a valuable aid in predicting the relative number of structures to be expected during particular historic periods. Adopting a schema derived from the previously cited authors, the following economic sequence is suggested (Fite and Reese 1965; Gordon 1978; Hunt and Sherman 1975; Samuelson 1973):

Boom	Contraction
1795-1815	1815-1825
1825-1832	1837-1843
1848-1873	1873-1895
1895-1913	1919-1940

During the early and middle nineteenth century, New England experienced two major population movements. The first was a large scale movement to the West, the second was the beginning of an internal movement within New England from rural areas to the old and new industrial cities. The second trend intensified in conjunction with urbanization in the late nineteenth and early twentieth century. In the 1830s-1840s, and in the 1880s and 1900s, New England also experienced a heavy immigration into its industrial cities of first northern Europeans (especially Irish) and then southern Europeans (especially Italian). After 1910 the Northeast also saw an increased movement of Blacks from the South (Bogart 1935:750).

Extractive Industries: Non-Agricultural. During the nineteenth century, cod and mackerel remained the main commercial focus of the New England fishing industry. In 1873, the peak size of the Massachusetts cod and mackerel fleets was reached (Curtis 1930:406-407). During the first few decades of the nineteenth century, whaling suffered a depression so that by 1818 there were only 16,750 tons of whaling ships in operation. But from 1820s to 1860s there was a rapid expansion of the trade, with the average size of the whaling fleet being some 600 vessels a year. During its peak in 1858 there existed 200,000 tons of whaling ships (Curtis 1930:404). However, by the 1860s due to over-hunting, the whaling trade had all but disappeared (Coleman 1963:36).

Forest industries, important in the Colonial period, maintained their importance during the nineteenth and twentieth century, although the vast bulk of lumbering now took place in northern New England. Especially significant for northern New England was the development of a technique in 1863 which allowed the direct conversion of lumber into pulp for the production of paper (Robinson 1976:71). Formerly, principal paper mills were located near cotton factories since paper could only be made from rags. (Bogart 1935:569). As late as 1850, the bulk of fuel for steamboats and railroads continued to be wood, and up to the 1870s wood provided 64% of the energy used in the United States (Hunter 1951:186, Tuttle and Perry 1970:412). By the 1910s, in contrast, wood was providing only 9% (compared to coal's 75%) of the American energy requirements (Tuttle and Perry 1970:412).

Iron production and manufacturing were still somewhat important following 1800, however following the 1830s, the center of production shifted to Pennsylvania (LeBlanc 1969:72-73). In the nineteenth century limestone kilning continued to be important. To meet expanding construction needs operations increased in size and began to operate continuously (Robinson 1976:112).

Extractive Industries: Agricultural. The bulk of the early nineteenth century New England population was still engaged in farming (86% in 1930), and it was fairly evenly distributed across the landscape, so much so that even very unproductive hill country was heavily populated (LeBlanc 1969:13). Given that the land was naturally poor and badly managed, when the western lands opened up in the early nineteenth century

and transportation improvements made low cost shipping a reality, a major decline in New England agricultural production set in, especially after 1825 (MHC 1975:34). The production of wheat declined from about two million bushels in 1839 to one million in 1859 to 166,000 in 1899 (Fite and Reese 1965:159, 423). After 1860 there also was a decrease in corn production. (Ibid:156). New England farmers responded by emigrating to the west, or to the cities (by 1900 New England was 80% urban), or by specializing in one branch of agricultural production. Maine, by the late nineteenth century, became one of the major centers of United State's potato production (FWP 1937:65). After 1850, commercial farming became very important and included the raising of garden vegetables for the urban market. The Connecticut Valley experienced a significant expansion of its tobacco production (for use as cigar wrappers) (Fite and Reese 1965:156). Flax was now raised not for its fiber, but rather for linseed oil (Fite and Reese 1965:156).

Merino sheep, introduced in the first decade of the nineteenth century because of the superior wool, became a "craze"; so much so that by 1811, more than 25,000 could be found in New England (LeBlanc, 1959:52). The craze peaked in the 1830s and 1840s (Bogart 1935:299), but sheep continued to be important through the nineteenth century. By the late nineteenth century, poultry became important in New England for their eggs as well as a source of meat. (Gilbert 1930:376). Dairy cattle, which even at the time of the Revolution had become a New England specialty, became especially so after 1840. From 1860 to 1900 dairy cattle increased by 200,000 despite the fact that other spheres of farm production were declining (Fite and Reese 1965:423). During the same period, a proportional increase in hay production to feed the cattle is also recorded. Up until 1860, the ox was still the main draft animal on New England farms; but after this date, with improvements and weight reductions in farm implements, oxen were replaced by horses (Bogart 1935:701; Gilbert 1930:376; McManis 1975:48). The horse, in turn, was replaced during the first two decades of the twentieth century by the steam engine and later the gasoline tractor (Bogart 1935:701-702).

Industrialization in New England. In 1790, Samuel Slater, who is usually deemed the "Father of the American Industrial Revolution" set up a mill for spinning cotton at Pawtucket, Rhode Island. There were earlier American textile mills, but Slater introduced an innovation by employing Arkwright spinning machines (Coleman 1963:77). The spun cotton was then farmed out to local households whose members wove and cleaned the cotton. This system could be called the Pawtucket System. Although the use of spinning machines was a crucial step in mechanizing the industry, the full potential for increasing production and profits was not exploited until the invention of the power-loom and cotton cleaning machinery after 1814 (Coleman 1963:77). Power looms however were only gradually introduced into Rhode Island; thus mills in this area remained small as a considerable amount of labor was still put-out to surrounding households (LeBlanc 1969:48). In 1813 the Boston Manufacturing Co. was incorporated under the control of the Appletons and Lowells. In 1814, on the Charles River at Waltham, the company set up a revolutionary kind of

mill. Within one factory several different processes were carried out. It had spinning machinery, a power loom, a machine shop, a bleaching and dying area, and eventually, a print shop (LeBlanc 1959:46). The Waltham System of a centralized factory complex became the prototype first for most of Massachusetts and northern New England, and eventually the rest of New England. The Waltham System also grew to include the building of worker housing, tenants of which are often single women from the surrounding rural areas.

The first large cotton textile factory was constructed at Lowell, Massachusetts in 1822. In 1823 it incorporated as the Merrimack Manufacturing Company. Like many of the other large factory complexes which were subsequently built, this enterprise was largely financed by capital originating in Boston. The growth in Lowell's population, from 2500 in 1826 to 20,000 in 1840, illustrates the effect that large scale industrial organization could have on population and urban growth. Mention has already been made of the spectacular growth in the number of textile mills in the 1820s. By 1831 large cotton factories could be found in Maine on the Saco River at Saco; in New Hampshire, on the Salmon Falls River at Somersworth; on the Coheco River at Dover; on the Lamprey River at Newmarket; on the Nashua River at Nashua; and in Massachusetts, on the Chicopee River at Chicopee (LeBlanc 1969:50). The Amoskeag Manufacturing Co. located on the Merrimack River at Manchester, New Hampshire was by the late nineteenth century the ultimate expression of the system initiated at Waltham in 1814. At this time the cloth mills extended three miles along the river. The company employed 15,000 people and had become "the greatest single manufacturer of cotton cloth in the world - producing one mile of material a minute" (Morison and Elting 1976:151-153). In addition, from 1849 to 1859 the company built 231 locomotives. After 1859, it also built steam engines, Springfield rifles, sewing machines and other items (Ibid:153).

Up to 1850 the textile mills and other factories were predominantly water powered, but by 1870 steam power was becoming very important. Since almost all available hydrological sites were already being exploited at this time and the need for energy was still expanding, there was strong economic pressure for the adoption of a new energy source such as steam (LeBlanc 1969:98). In the 1880s, although large scale plants on the major waterways continued to be important, the center of textile manufacturing switched to Fall River and New Bedford. Although both of these sites were poorly endowed in terms of hydrological factors they were advantageously located for the use of coal-powered generation of steam. (Bogart 1935:575; MCH 1975:37). After the First World War the textile industry was still important but already was fast losing ground to the new textile plants being built in the South.

Extremely important for the development of the woolen industry in New England was the introduction of Merino sheep into New England in the first decade of the nineteenth century. This innovation, coupled with creative entrepreneurship and new machinery, resulted in the rapid expansion of the woolen textile industry from 1790 to 1815 (LeBlanc

1969:51-52). Rhode Island, with its fine grazing land, by 1815 had wool textile mills in 21 of its 31 towns (LeBlanc 1959:52). Introduction of the first power operated spinning jennies in 1819 and 1821 produced major increases in production volume (Curtis 1930:413). Fairly quickly, due to the expansion of flocks, increased investment, and the adoption of new technology, woolen factories were established in many of the rural areas of New England. By 1869, as a result of this expansion, Boston had become the principal woolen port of the United States (LeBlanc 1959:52). The woolen factories were widely dispersed (unlike the cotton mills), and correlated with the distribution of existing sheep flocks (LeBlanc 1969:55).

Tanning in the early nineteenth century was still fairly widespread, but there was a slight concentration of larger firms in eastern Massachusetts. Because of local depletion, tanbark was imported from Maine. The larger tidewater centers continued to be especially dependent on imports and were often located near shoemaking factories (LeBlanc 1969:67). Lynn, Massachusetts and other towns in the eastern area of the state were the early nineteenth century centers of the shoe industry. Before 1850, farmers and fishermen in their off season provided much of the labor in what was previously a handicraft (pre-1820) and putting-out system (1820-1850) (LeBlanc 1969:62, 65). By 1850 division of labor and specialization had increased to a large extent. Rather than putting-out the work, employers now concentrated the work in a central factory. In the 1860s the sewing machine was adopted and power was applied to several processes, thereby making shoe manufacturing into a full scale industrial enterprise (LeBlanc 1969:62). Massachusetts, always noted for its shoe and boot industries, continued its dominance until World War I. After World War I cost increases and profit factors caused the industry to move to the Midwest (Fite and Reese 1965:361).

The towns of the Naugatuck and Connecticut River Valleys were the major centers of various metal fabricating industries during the nineteenth and early twentieth century. The Naugatuck Valley was known for its firearms, clocks, watches, locks and tools (LeBlanc 1969:36). The Connecticut Valley was famous for its rifles, machinery, axes, waffle irons, augers, and bits, all of which found their way to a national market (LeBlanc 1969:73). Waterbury, in the Naugatuck Valley, was especially well known for rolled brass. In fact during the first half of the nineteenth century Waterbury produced the entire United States output (LeBlanc 1969:34). The furniture manufacturing center of the United States was located in Boston and eastern Massachusetts until 1830, after which the main center shifted to the north-central section of the state (LeBlanc 1969:32).

Shipbuilding continued to be an important enterprise during the early nineteenth century. Besides providing ships for the merchant marine, large numbers of ships were produced for the fishing and whaling industries. In the 1840s and 1850s New England, especially East Boston, became famous for its production of high speed clipper ships (Curtis 1930:408). The Clipper era, however, was short lived. After 1860, iron

steamships, mostly built in Europe, rapidly replaced clippers as the dominant form of trans-oceanic transport.

Commercial Enterprises. Intercoastal trade continued to be important throughout the nineteenth century, but except for the surge in trade produced by the opening of Japan and China in the nineteenth century, there was a severe decline in American commercial shipping especially after the 1860s. Merchant capital in New England, rather than being invested in risky overseas ventures, was being invested in lucrative local industrial and commercial ventures. Internal trade witnessed a major reorganization after 1800. By this time the general store had become the predominant form of retailing. In rural areas, however, some itinerant craftsmen and peddlers could still be found well into the nineteenth century. In the cities various specialty stores began to appear. These included grocery stores, hardware stores, drug stores, dry good firms and liquor stores. By 1850 the first department stores were established. Chain stores followed in the late nineteenth century (Fite and Reese 1965:246).

Transportation and Communication. From the 1790s to the 1830s the main elements of New England's canal and lock system were constructed. Although important locally, these facilities never were of national economic significance since the rivers on which they were constructed penetrated into a limited and fairly isolated resource base. On the local rivers during the early nineteenth century, could be found canoes, small skiffs, riverboats and sailboats of various types. Sailing the larger rivers and the coastal waterways of the early nineteenth century were the packets, sloops, and schooners. Since the roads were so poor at this time, these ships carried the bulk of regional trade as well as the interstate postal deliveries (Tuttle and Perry 1970). Prior to the 1820s the brig was the primary ocean going ship, but it was replaced after this date by ships of larger carrying capacity or of higher speeds, such as the packet (Bogart 1935:246). The famous high speed Clipper ships, built in New England, dominated ocean travel and high speed transport during the 1840s and 1850s. After these years they declined rapidly in importance being supplanted by more reliable and spacious steamships which were already making regular transatlantic crossings by 1838 (Fite and Reese 1965:205). In 1815 the first steamship commenced operation on Long Island Sound. By the 1880s the bulk of commerce on the Sound was being transported in steamships (Van Dusen 1961:321). By the end of the nineteenth century almost all water transport, riverine, coastal, and ocean was being carried by large iron steamships. By that time sailing ships, rather than being the crucial means of transportation, became relegated to a means of sport and entertainment.

From 1790 to 1850 the United States experienced a surge in roadbuilding summarized by the term, the Turnpike era. Hundreds of companies incorporated and issued stock in order to construct roads which would then be maintained by collection of toll charges. As a result of this activity, a fairly complete turnpike system criss-crossed New England by 1825 (Fite and Reese 1965:188). In addition to the usual

wagon, carriage, equestrian, and droving traffic, stagecoaches, running on regular schedules, travelled the turnpikes connecting the major cities and towns. At periodic distances these routes were serviced by inns and taverns. The turnpikes were a significant short term improvement which encouraged the development of local land travel and trade. However, turnpikes quickly fell into bankruptcy and disrepair. This occurred because of overexpansion, competition from railroads, and because of high maintenance costs. Since road construction techniques were primitive, road beds were constantly in need of repair. Thus potential profits often had to be plowed back into maintaining the road. Also, before the invention of the automobile, land based transport was animal powered and hence very slow and costly. Before the 1830s most manufactured goods and raw material continued to be carried by water, and after this time most transportation switched to the railroads (LeBlanc 1969:16).

In 1826 the first railroad in New England began operation at Quincy, Massachusetts. By 1835 three rail lines connected Boston with Lowell, Worcester and Providence. In 1850 more than 2200 miles of track were in use in New England. Connections had been established between Boston, New York, Albany, and Montreal (LeBlanc 1969:16). Adapting steam power to pull passenger and freight trains along iron and later steel rails produced a dramatic increased efficiency and an equally drastic decrease in the cost of land-based transportation. Until the 1920s railroads were the preeminent carriers of most local and regional passenger service, raw materials, and manufactured goods.

The automobile was perfected in the 1890s but it did not assume major importance until the 1910s and 1920s. By this time buses and automobiles had already replaced the electric trolley systems as the prime means of travel between the new suburbs and the inner cities. In addition, trucks were competing very successfully with railroads as carriers of light raw material and finished manufactured products, especially within the urban core area and between the cities and their hinterlands. In conjunction with the increasing use of these vehicles, major highway improvements and expansions began during the First World War and increased in extent during the 1920s and 1930s (Fite and Reese 1965:541; Tuttle and Perry 1970:352). By 1930 there were 26.5 million automobiles in the United States. Given the complex of support and service industries associated with the making and servicing of motor vehicles, the automotive industry, which barely existed in 1900, by 1930 had become the leading most economically significant sector of the American economy (Bogart 1935:735, 783).

The invention of the telegraph in 1841, the telephone in 1876, and the radio in the 1890s vastly increased the speed and range of commercial transactions and social communication. Both the telegraph and telephone quickly achieved their potential, while radio only became commercially significant in the 1920s.

Population and Settlement Patterns in Southern New England

For most of the 12,500 years during which human populations have inhabited New England, the coastal lowlands and areas adjacent to the major rivers have always been the most densely populated regions in New England. Proximity to waterways and to the ocean has always been desirable because these were areas which provided potable water, and had ample supplies of plants, animals, and other resources. Waterways also supplied natural routes of communication and trade. After the introduction of native horticulture and European agriculture, coastal areas and river bottoms were the environmental zones which were most easily tillable and the richest in agricultural potential. In historic times, river valleys were especially important because the falls found within them provided immense amounts of potential hydro power. In the Prehistoric period lasting for 12,000 years, the low population levels and simple labor-intensive technology permitted only a limited repertoire of site types. Up to Middle Woodland times site types included large camps, small camps (recurrent and temporary), rockshelters, quarry sites, cemeteries, hunting grounds, gathering areas, and fishing sites and facilities. After A.D. 1000 large villages with surrounding horticultural fields were added to the existing settlement types. Some of these sites were fortified (palisaded) and set on defensible positions, reflecting the increased warfare of the era.

During the Paleo-Indian and Early Archaic periods (10,500-6000 B.C.) population density was very low and local groups were migratory and small in size. Climate and topographic features, given the recent retreat of the glaciers, were of a non-modern configuration. These factors added together make the discovery of sites from this period extremely difficult.

From the Middle Archaic period (6000-3000 B.C.) to the Late Archaic period (3000-1000 B.C.) there was a steady increase in the number, size, and diversity of site types. The Middle Archaic shows evidence of fishing and resource diversification which eventually evolved into the socioeconomic diversity of the Late Archaic. The Late Archaic was a period of peak population and also the period during which mortuary ceremonialism began. During the Transitional (1000-500 B.C.) and the Early Woodland period (800-200 B.C.) there is some evidence of climatic deterioration, infrequent occupation of the interior, and decrease in overall population size, but not in site diversity. Interestingly, these were the periods of peak mortuary ceremonialism and the time when true pottery was first used in southern New England. The end of the Middle Woodland (200 B.C.-A.D. 900) was the period during which the village horticultural complex and probably the corporate descent groups of the Late Woodland and Ethnohistoric periods were first established. It was also a period of expanding population density and increasing site diversity.

The trends initiated in the Middle Woodland culminated in the complexity of subsistence pursuits and cultural elaborations seen in the

Late Woodland (A.D. 900-1500) and Ethnohistoric (1500-1680) periods. The corn-beans-squash complex, maintained after A.D. 1000, in conjunction with continued exploitation of traditional, undomesticated food resources, required a fairly elaborate and complex scheduling of seasonal movements. These new crops also expanded the food base, increased nutritional diversity, and provided greater economic security for the peoples of these periods. In tandem with these developments, populations of the Late Woodland expanded to their highest levels since the Late Archaic. It has been estimated that by 1550 there were at least 90,000 Indians in southern New England.

During the Ethnohistoric period, in addition to the site types found in the Late Woodland, there were also fur trading rendezvous sites, wampum manufacturing areas along the coast, beaver trapping grounds in the interior, early reservation communities (Praying Indian Towns) after 1651, and continuation of the use of fortified sites (residential and non-residential). Fortified sites during this period do not represent competition for agricultural land as had been the case in the Late Woodland; they rather reflect competition for access to fur supplying areas, wampum production sites, and European trading posts. Due to epidemics and warfare occurring from 1615 to 1676 Indian societies experienced progressive land dispossession and population reduction. In 1610 at least 70,000 Indians lived in southern New England, however, by 1680 only about 10,000 remained. Most of these groups were located in the hilly western sections of Connecticut and Massachusetts. There should therefore be a steady decrease in the number of sites through the end of the seventeenth century.

European sites from the Initial Exploration period (1497-1620) were located along the coast or at the mouths of major interior rivers. This reflects the fact that they were either fishing stations and/or early fur trading posts. Fur trading posts tended to move upriver as competition for dwindling supplies of furs increased. During this initial period, the numbers of Europeans engaged in fishing and fur trapping off the New England coast were relatively small. Their sites were widely scattered and because of their temporary nature, flimsy in construction. Because of their small numbers and small size, these sites are extremely hard to locate. Given the lack of documentary evidence, these sites are of crucial importance as a major source for reconstructing initial European adaptation to the New World.

Sites from the Colonial Settlement period (1620-1790) are much more numerous and diverse in size and type than are sites from any of the periods which precede it. From the seventeenth through eighteenth centuries European population in New England increased rapidly in number. By the mid-eighteenth century just about all of southern New England was divided up into towns and cities. From the beginning of the Colonial Settlement period, towns and cities tended to be located within those regions that had natural harbors for water transportation, and which also had good agricultural land and ample supplies of raw material for export and domestic use. These included the coastal low lands and

lands along the interior rivers. During the Colonial Settlement period sites could be found in three possible relationships to other sites: isolated, aggregated, and highly aggregated. Isolated sites in frontier areas included trading posts, military forts, lumbering camps, and mining operations. In coastal areas isolated fishing stations still occurred. The famous New England villages and towns are examples of aggregated site locations. Typically, these would consist of a central village green surrounded by dwellings (initially mostly farmers, but later villagers), an inn or tavern, stores and shops, a meeting house, churches, a school, and various mills (grist, saw, fulling). Around this center were the agricultural fields, woodlots, and communal meadows. Before the Puritan corporate ideology broke down at the end of the seventeenth century the village center, besides being the social, religious, political, and commercial center, was also the residential center for the farmers. By the eighteenth century, the village was still a social and commercial center but rural areas became dotted with isolated farmsteads which consisted of contiguous parcels of land. Farm structures included houses, barns, sheds, outbuildings and fences surrounded by fields, meadows, and woodlots. Also found scattered across the landscape were saw and grist mills; forges; charcoal, potash and lime kilns; taverns (along major highways); and roads and bridges. Highly aggregated settlements included the large towns and small cities. Both of these settlement types retained their agricultural services but also acted as regional and even inter-Colonial marketing and transport centers. Along the waterfront of these cities were found large warehouses, merchant offices, shipyards, tanneries, distilleries, and light manufacturing firms. Surrounding these were stores, shops of craftsmen, hotels, taverns, educational structures, governmental structures, offices of doctors and lawyers, churches, and theaters. Also found here were parks and marketplaces. Around this were dwelling places of the upper, lower, and middle classes. Because of the dependency of New England during this period on a large volume of import-export trade, the largest urban centers grew up around natural harbors capable of handling large numbers of ocean-going vessels. An important factor in later urban expansion was access to a sizable hinterland capable of agriculturally supporting the urban population.

In the period of Political Independence and Economic Maturation (1790-1930) the basic settlement patterns established in the eighteenth century continued to function through the 1830s-1840s when the full effects of industrialization began to be felt. Since most of the power driving the factory machinery was supplied by running water there became a strong tendency for factories and population to locate along breaks in the major rivers where dams could be built. As industries expanded in size there was also a tendency for large firms to move upriver where larger supplies of hydrological power existed. However, with the full exploitation of suitable hydrological sites and the adaptation of steam engines to manufacturing, after the 1870s there was a shift back to site locations toward the coast and existing population centers (for example, Fall River and New Bedford).

The opening of the Erie Canal in 1825 and the interregional railroad network by the mid-nineteenth century, along with industrialization, resulted in emigration of the rural population west, emigration of the rural population within New England to the old and new commercial and industrial centers, and immigration of Europeans into the large urban centers. New England agriculture declined, and especially after the mid-nineteenth century specialized in garden and truck farming, arboriculture, poultry raising, and especially dairying. Railroads, by the mid-nineteenth century, had become important in linking New England manufacturers to a national market and were also carrying large amounts of foodstuffs and raw materials from the Midwest into New England urban centers. Within New England, railroads transported locally produced farm products to nearby urban markets. Advantageous location of railroads, especially in interior regions with poor river transport, could add to the prosperity of a town or, if poorly located, could cause its deterioration or even abandonment.

The mass production and use of automobiles after the 1910s initiated another major shift in settlement patterns and site locations. Automobiles quickly supplanted electric trolley systems as the main link between suburbs and urban centers and encouraged even further a ubiquitous, diffuse suburban sprawl. Unlike railroads, which encouraged the continuation or establishment of communities at fairly evenly spaced intervals (for example, around railroad stations), automobiles encouraged a linear settlement pattern. This consisted of strips of commercial and residential developments paralleling the major highways which in turn tended to crisscross and spread over the entire landscape. Besides the railroad and road networks, the most impressive new sites of the mid-nineteenth century to the early twentieth century were the huge factory complexes, the large commercial establishments, and the high-rise apartment buildings, which were located in or near the major urban centers. There appears to have been a direct correlation between the size of the population center, and the number, size, and specialization of the various industrial and commercial establishments. By the late nineteenth century the city and the rural areas were separated by a belt of suburbs. Much farmland became abandoned or swallowed up by suburban/urban expansion. A number of the more remote rural and forested areas became areas of summer camps, cottages, and resorts. These were connected to the urban population centers by the railroads, and later, by the extensive network of automobile highways.

History of the Fort Devens Area

The area in which Fort Devens is situated is currently within the boundaries of the towns of Lancaster, Harvard, Shirley, and Ayer. Prior to 1871 the town of Groton was also included within the current boundaries of the Reservation.

Prior to the mid-seventeenth century, the Fort Devens property was part of the territory of the Nashaway Indians, who were led by their sachem, Sholan. The Nashaways were foragers and also practiced corn

horticulture. Linguistically and ethnically they were a subdivision of the Nipmuck, but in the seventeenth century they were apparently under vassalage to the Massachusetts Indians located around Boston Harbor (Salwen 1978:170). In 1643 the Nashaway sachem invited Thomas King and other English settlers at Watertown, Massachusetts, to settle at Nashawogg, along the Nashua River within the modern town of Lancaster.

King obtained a deed from the Massachusetts General Court which stipulated that the English settlers would not molest the Indians in their hunting, fishing, or planting places (Barber 1840:574-575). King and a man named Symonds then built a trucking house along the Nashua and proceeded to trade with the local Indians, presumably for furs (Barber 1840:575). In 1653 the Plantation of Nashaway, as the new settlement was known, was incorporated as the Town of Lancaster. At the first town meeting a year later, 25 individuals were listed as townsmen (Barber 1840:575). In 1655 Dean Winthrop, son of the Governor, obtained a land grant to property located to the east of Lancaster. This was the area which later became the town of Groton. In 1675 and 1676 the Fort Devens area suffered Indian raids as part of the larger Indian uprising known as King Phillip's War. Over fifty families who lived in Lancaster at the time were killed, captured, or finally forced to abandon their homes (Barber 1840:575-576). Sporadic and smaller scale attacks on the area also occurred in 1692, 1704, 1705, and 1710 as part of the Anglo-French and Indian Wars. In 1732 Harvard separated from Lancaster, Stowe, and Groton and in 1753 Shirley detached from Groton. Ayer detached from Groton only in 1871 after it had become a minor railroad and manufacturing center.

From the seventeenth through the mid-nineteenth century, the project area was characterized primarily as an agricultural region. Before the nineteenth century, as was the case elsewhere, farming was primarily a subsistence nature. In the mid-nineteenth century it was noted of Groton (which then included Ayer) that "the town is mostly a farming town, and formerly has raised large quantities of hops" (Barber 1840:390). Harvard was cited for its "finely cultivated and productive lands" (Barber 1840:572). By the end of the nineteenth century it was noted that Harvard produced "large quantities" of apples, pears, and walnuts which were exported elsewhere. Shirley was also known for its apples and pears as well as for its cranberries (Nason 1890:360, 593).

In 1837 Lancaster had one woolen mill, three cotton mills, six comb factories as well as engraving, printing, and bookbinding operations. Harvard had three paper mills. Shirley had one woolen mill, three cotton mills, two paper mills, and local craftsmen were responsible for the production of 74,000 palm hats (Barber 1840:424, 572, 578). In 1885 the following industries were listed as functioning in the area: Lancaster was active in producing cotton yarn, wool goods, wire, bricks, brooms, machinery, and metallic articles; Harvard had only one or two saw mills which continued in use. Shirley had a cotton mill, a paper mill, a suspender factory, and it also produced lumber, leather, hoops, baskets, brushes, brooms, straw goods, wrought stone, agricultural implements, and

metallic goods. Ayer was, at this time, a substantial industrial center. In addition to being a rail center there were thirty-one manufacturies producing products as diverse as "wooden goods", iron and metallic work, clothing, building material, prepared food, leather, straw goods, carriages, paper goods, candles, and soap (Nason 1890:130, 360, 594).

Following are population figures for the five towns through time:

	1835	1870	1885
Lancaster	1903	1845	2050
Harvard	1566	1341	1184
Shirley	967	1451	1242
Groton	2057	3384	1987
Ayer	--	--	2190

It should be noted that although Lancaster's population stayed fairly stable through time, Harvard's steadily declined, while Shirley's fluctuated. Ayer due to its industrialization rapidly grew in population. In 1886 the following statistics were reported and can be derived from these towns:

	No. of Dwellings	No. of Farms	Area (acres)	Pop. Density (per 100 acres)
Lancaster	420	157	16,192	12.7
Harvard	271	210	16,144	7.3
Shirley	290	112	9,255	13.4
Groton	467	174	19,770	10.6
Ayer	---	48	4,983	43.9

(Selected census statistics for the Five Towns from 1885).

Assuming that each farm is represented by one dwelling it becomes apparent that almost all dwellings in Harvard were farmhouses and that there probably existed virtually no other form of livelihood in the town besides farming. By contrast Lancaster, Shirley, and Groton had more than twice as many dwellings as farms indicating that other pursuits beside farming were available to the local population. The fact that Harvard has by far the lowest population density and the highest density of farms also supports the hypothesis that Harvard was still a heavily agrarian, non-industrial town. Ayer is known from documentary evidence to have been heavily industrialized. The fact that it has a population density six times that of Harvard and almost four times that of Shirley--its nearest competitor--underscores the fact that industrialization allowed and selected for such population concentration. Turning to the 1870 Beers Atlas of Worcester County and the 1875 Beers Atlas of Middlesex County it appears from the available maps that structures existing within the project area included about 15 dwelling houses (most of which were probably farm houses).

Historical Fort Devens

Fort Devens was commissioned in 1917. At that time most of the troops lived in tents and the administrative buildings were one or two

story frame and clap board buildings. Several of these still exist, including the Officers Club, built in 1918. From the period 1917 to 1919 the following buildings were constructed:

Date Built	Original Use
1917	Family Housing
1917	Steam Heating Plant
1917	Storage Shed
1917	Blacksmith's Shop
1917	Post Bakery
1917	Storehouse
1917	Heating Plant
1917	Electric Substation
1918	Main Post Exchange (PX)
1919	Warehouse

TABLE 9: Dates of Construction of Oldest Standing Buildings on Fort Devens.

These buildings are still in use and they have all been extensively modified either to allow them to serve new functions, or to modernize the buildings. The second building period was from 1929 to 1932 when most of the brick buildings on the post were built, including the large headquarters quadrangle, the present Post Museum and the Post guardhouse. The South Range area was acquired just prior to World War II. At that time it was a rural, sparsely inhabited area (May, personal communication).

Another item of interest at Fort Devens is a sniper training device. It is a hollow tree made of poured and reinforced concrete. It was found during new construction and has been put on display at the north gate of the Main Post. It has, because of its uniqueness, become a local landmark.

Plate 1. Facility 1, Officers Club, Fort Devens, Mass.

Plate 2. Facility 1, Bldg. P-211, Fort Devens, Mass. The Steam Heating Plant. Built in 1917 at Fort Devens, Massachusetts. It has been converted to oil.

Plate 3. Facility 1, Post Museum, Fort Devens, Mass. The Post Museum was built as a stable in 1932.

Towns of Hingham and Cohasset

The Hingham facility is located within the towns of Hingham and Cohasset. This area was included during the Ethnohistoric period within the tribal bounds of the Massachusetts Indians. (Salwen 1978:161). The Massachusetts were an Algonquian group whose members practiced slash and burn corn horticulture and also hunted, fished, and gathered. About 1633 the Hingham area was first settled by English colonists, a number of whom arrived from Hingham, England. The area in which they first settled was originally called Bear Cove but in 1635 it was incorporated as the town of Hingham. At this time the town also included the area which was later to become Cohasset. Most of the land first utilized by the new settlers had been cleared by the Indians. Not only did the English adopt native crops, such as corn, they also continued to practice the same wasteful slash and burn procedures which the Indians had utilized (Hersy 1893:181). During the eighteenth and nineteenth century agriculture continued to be practiced in the Hingham area, but given its location, shipbuilding, trading, and fishing became important economic activities. In 1770 Cohasset had expanded to the point where it was incorporated as a separate town.

By 1837 the following commercial ventures were operating in Hingham: a woolen factory, an iron foundry, a brass foundry, salt works, a "variety of mechanical works," a printing office, and a book store. It was also noted that "shipbuilding is carried on to a considerable extent." Seventeen vessels were built in 1837. Also present in town were a "large number of traders in foreign and domestic goods" (Barber 1840:505-506). Approximately 80 ships were listed as engaged in the cod and mackerel trade and the coastal trade. Other products produced in town were boots and shoes, wooden ware, and umbrellas. (Barber 1840:506). Cohasset was termed a summer resort in 1837, but it also was listed as employing 36 vessels in the cod and mackerel trade. Also 17 vessels are reported to have been built here between 1832 and 1837 (Barber 1840:455).

In 1885 it was reported that Hingham grew cranberries. Some of the town products listed were cabinet ware, cordage, wooden ware, boots and shoes, upholstery trimming, building establishments, worsted goods, iron castings, hatchets, and leather. (Nason 1890:371). In the same year Cohasset is termed a "seaboard town and watering place." Here were located summer residences of wealthy families. The fishing industry also was listed as still being important. (Nason 1890:243-244).

Listed below are some statistics concerning the above two towns:

	Population		1885 Statistics		
	1835	1885	Acres	No. of Dwellings	No. of Farms
Hingham	3445	4375	12973	1060	63
Cohasset	1331	2216	5970	582	52

It becomes apparent after looking at the population figures that Cohasset increased much faster in population than did Hingham, which probably reflects the construction of summer houses for the wealthy. The low percentage of farms compared to dwellings in both towns reflects the prevalence of commercial activities in Hingham and of resort activities in Cohasset. In the 1876 Sherman Map no structures are shown in the section of Cohasset now within the modern boundaries of the Hingham Reservation.

The Hingham Facility was acquired during World War II and was used as a naval ammunition dump. It is presently used as a Reserve Center although it is now much reduced in size since over two thirds of it has been returned to local control. A large portion of the surplus land is now the Wampatuck State Forest.

Fort Nathaniel Greene

Fort Greene is located in the Point Judith Neck section of the town of Narragansett, Washington County, Rhode Island. Point Judith Neck is a very flat low lying peninsula surrounded on the east and south by the Atlantic Ocean and on the west by Point Judith Pond.

From earliest contact to King Philip's War of 1675-1676, Narragansett Bay and most of the rest of Rhode Island, including the project area, was the territory of the Narragansett Indians, who were Algonquian tribal horticulturalists and foragers (Salwen 1978:161; Simmons 1978, maps in Simmons 1978:172). The shore areas of Rhode Island, one of which is Point Judith Neck, were exploited by the Narragansett. From the numerous estuarine microenvironments large numbers of crabs, lobsters, clams, oysters, fish and waterfowl were gathered (Simmons 1978:190).

From the 1630s to the 1670s the entire southern half of Rhode Island was known as the "Narragansett" or "South Country". During this period the Colony of Connecticut vied with the Rhode Island settlers for control of the area (see map in Jennings 1975:256). Finally, Rhode Island's authority was recognized in the 1670s. The first European settlement of the South Kingston area was in 1657-1658 after the Pettaquamscutt Purchase was negotiated with the Narragansett (Cole 1889:484). During the late seventeenth and eighteenth centuries the two Kingstons became areas where large plantations devoted to agriculture and animal husbandry became established, along with a landed aristocracy which had strong ties to the Newport merchant elite (Steinberg and McGuigan 1976:104).

By 1730 South Kingston population had expanded to 1523. In 1774 population had grown to 2835, it then declined, rebounded in 1800 to 4131, and grew to 4717 in 1860. From 1674 to 1723 the area in which Fort Greene is located was part of the town of Kingston. In 1723 South Kingston, in which Point Judith was located, separated from Kingston, creating North Kingston. In 1729 both towns were included in King's (later Washington) County. The town of Narragansett separated from South Kingston in 1888, but it did not incorporate as a separate town until

1901. In 1889 the population of the newly separated town of Narragansett was 1,523 (Cole 1889:484; Coleman 1963:21, 220).

During the American Revolution a warning beacon and a life saving station were established at Point Judith at the tip of the neck (Steinberg and McGuigan 1976:123). The ocean opposite this point prior to and following this time was famous for its navigational dangers. In 1806 the first lighthouse was established. After it blew down in 1815, it was replaced by a new structure in 1816 (Cole 1889:622-624). Both a lighthouse and lifesaving coastguard station continue to function from here up to the present (see 1877 Thompson Map, 1891 USGS Map, 1975 USGS Map). Point Judith also became the most important ferry port from the mainland to Block Island. In 1889 the population center that grew up directly behind the point was classified as a "minor locality" (Cole 1889:481).

Throughout the nineteenth century South Kingston, unlike most of the rest of Rhode Island, was never heavily involved in the production of cotton textiles, but more than any other town it was involved in sheep raising and the production of wool textiles (Coleman 1963:97-98, 135; Hayward 1839). In 1820 South Kingston had only two woolen mills, but by 1832 it had seven mills with 120 workers, the most of any town in Rhode Island. By 1840 the town had ten spinning and weaving mills as well as 11 fulling mills (Coleman 1963:97-98, 135). In 1839 it was noted that besides sheep, South Kingston was known for its dairying, grains, and fisheries (Hayward 1839). By the late nineteenth and early twentieth century the town of Narragansett became known for summer resorts rather than agricultural or industrial pursuits (Steinberg and McGuigan 1976:122).

The Fort Greene Reservation is located about a mile and a half north of the point and because of its tendency to flood was never heavily settled. The 1877 Thompson Map shows Route 108 running north-south to the point but no other roads. A schoolhouse located to the southeast of the current reservation indicates that there was some population concentration in that area. The 1891 USGS Map shows Route 108, as well as Ocean Road along the Atlantic and Burnside Road to the north of Fort Greene. This suggests that by the 1890s the area probably had experienced some growth. Fort Greene was established in 1941-1942 and within its bounds was constructed a U.S. Army coast artillery battery. It is now a Reserve Center and training area.

CHAPTER 5

METHODOLOGY

Introduction

In order to provide the sponsoring agency with a means of assessing the density, distribution and significance of cultural resources located within the Fort Devens Military Reservation and its off-base facilities, a model for predicting archaelogical site location was developed. The design employed the principles of ecological anthropology in which environmental characteristics are used to explain patterns of prehistoric settlement and subsistance (Hardesty 1977:1). It was assumed that prehistoric "sites were located so as to minimize the effort expended in acquiring critical resources" (Green 1973:279), especially the resources directly or indirectly concerned with the subsistence activities of the group, primarily food. Based on this theoretical orientation two models were developed to assess the archaeological resources potential of Fort Devens and off-base facilities.

The zonal model assesses the prehistoric site potential of a two kilometer circle around each facility while the locus-specific model evaluates the immediate location of each facility. Each of these models is discussed in the following section.

The Zonal Model

The zonal model creates and assigns a Zonal Environmental Score (ZES) to an area depending on the type and amount of desirable environmental features present. The higher the score, the higher the probability that sites are located in the zone. The scores are additive, that is, the more desirable features that are present in a zone, the higher the score. The resultant scores are relative measures of site location probability or significance. The scores may be considered raw data at the ordinal level for quantitative processing. The variables used for this model were based on archaelogical ecologically-oriented studies (See Brose 1976; Dincauze and Meyer 1977; Green 1973; Hammer 1979; Quilty and Versaggi 1979; Snow 1979; Thomas 1974; Versaggi and Ewing 1979). While cultural and social variables also play a role in prehistoric site locational decisions, they were not utilized in this study for several reasons. They are difficult to identify and quantify since they must be inferred from the archaelogical record. Additionally, the motivation behind the use of this particular model is to provide general associations between site location and environmental variables regardless of cultural or temporal affiliation. Each site is treated simply as a point on an ecological map.

The most favorable areas for prehistoric groups to exploit were those areas between two ecozones, so that both could be utilized. Environmental conditions which divide an area into two ecozones include streams, rivers, bluffs and terraces, and changes in vegetational conditions. The variables used are believed to measure the environmental attributes which would make a specific location a desirable place for habitation. For example, it has long been assumed that drained areas near water with non-acidic soils were ideal places for food gathering and settlement (Ritchie, Funk 1973). It is attributes such as these that the variables attempt to measure. The values and range for each variable are relative and are based on their traditionally assumed importance. For instance, for the variable SLOPE, the greater the amount of terrain which has a slope of under 5%, the higher the assumed desirability of a location, thus a higher score. The maximum contribution any variable can make to the total score for any area was also determined this way. The variable SLOPE can contribute a maximum score of two while the variables TOPOGRAPHY or FLOODPLAINS can contribute a maximum of five each because we suspect that the variables TOPOGRAPHY and FLOODPLAIN are more important than SLOPE to the general desirability of a location in terms of habitation and resource distribution.

The variables and their values are given in Table 10. Variables marked with an asterisk allow for more than one code or score, for example, the variable BODIES OF WATER. If there is more than one stream in the region, then the appropriate value for each stream can be added to the total score.

Bodies of Water*:

Value	Score
Creeks less than 2 meters wide which run all year	.5
Creeks 2 to 5 meters wide	1.0
Rivers 5 to 10 meters wide	2.0
Rivers 10 to 30 meters wide	3.0
Rivers wider than 30 meters	4.0
Ponds (under 5 acres)	1.0
Lakes (over 5 acres)	2.0
Tidal flats 1.0	
Swamps (5%-20% of area)	1.0
Swamps (20%-50% of area)	2.0

Slope:

Value	
25% to 50% of total area, 5% slope or less	1.0
50% to 75% of total area, 5% or less	1.5
75% and up of total area, 5% of slope or less	2.0

Topography:

Value	
Drained feature on poorly drained area	
5% to 10% of area	1.0
10% to 15% of area	2.0
15% to 20% of area	3.0
20% to 25% of area	4.0
above 25% of area	5.0

Flood Plains:

Value	
5% to 10% of total area	1.0
10% to 20% of total area	2.0
20% to 30% of total area	3.0
30% to 40% of total area	4.0
50% or more of total area	5.0

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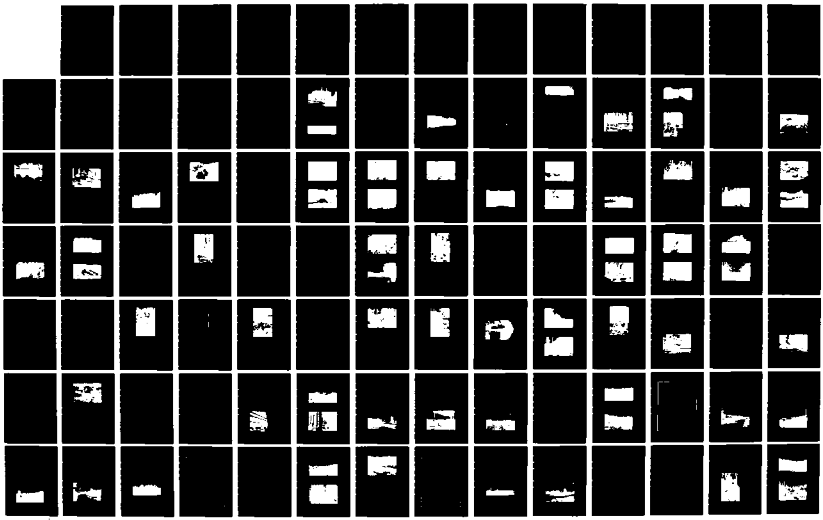
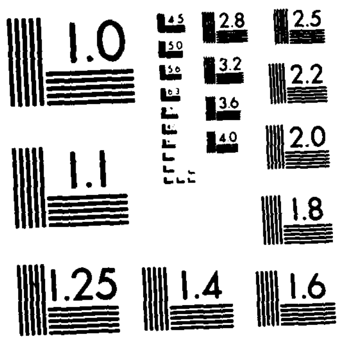



1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

Bluffs and Terraces overlooking water, swamps or flood plains:

Value	Score
250m to 500m of linear distance	1.0
501m to 750m of linear distance	2.0
751m to 1000m of linear distance	3.0
1001m and up of linear distance	4.0

Forest and Drainage:

Vegetation Type:

Value	
Dominant forest type-mixed Conifer-hardwood	1.0
Dominant forest type hardwood	2.0

Drainage:

Value	
Dominant soil drainage-fair	2.0
Dominant soil drainage-good	3.0

Table 10. Zonal Model Variables

Stream rank was used as a variable because it has been demonstrated that prehistoric groups tended to settle near stream and rivers for a variety of reasons. Nearby water provided them with potable water, food resources such as fish, shellfish, migratory birds, and the water provided a transportation route. Faunal populations also used the water resources, making them available for human utilization. The size of water resources, therefore, is important in describing variability in an environmental setting.

The variables of drained features on floodplains, swamps, low level ground, percentage of floodplains, and length of bluffs and terraces in the area were used due to prehistoric groups' preference for locations near water and in environmentally variable areas. Drained features on floodplains provide dry areas with good visibility of the surrounding areas, which are close to water. Bluffs and terraces also offer desirable, well drained habitation areas in close proximity to subsistence resources, and they also offer good visibility of the surrounding low land areas and are between the resources offered by the nearby water and forests. Empirical evidence suggests that swamps are important resources (Funk:1976). Swamps provided migratory birds and game animals which exploited the swamps' plant and animal resources. Locations near swamps provided groups with the opportunity to exploit the

swamps and nearby forest and fresh water resources. The amount of level ground is also an important variable for predicting site locations because prehistoric groups presumably preferred to live on fairly level ground.

The unit of analysis for the zonal model was defined as a circle with a two kilometer radius centered on each facility. The area of such a circle is 3200 acres. The information about each circle was taken from maps of soil and forest types, U.S.G.S. quad sheets and by field notes taken at each facility. The actual computation of the ZES involves summing up the variable scores for each facility.

The Locus-Specific Model

The locus-specific model has a much smaller unit of analysis than the zonal model. However, the differences in the two models go beyond the scale of the areas involved. The zonal model used variables whose optimal values have been defined deductively, that is the variables have long been assumed to measure desirable environmental qualities of the zone surrounding a facility (Hardesty:1977; Jochim:1970; Ritchie and Funk 1973; Versaggi and Ewing 1979; and others), such as drained areas near water, deciduous forests and basic soils. The locus-specific model, on the other hand, uses empirically defined variables which are based on the attributes of known sites in the project area.

Although the same general types of data are quantified in both models the treatment is different. For the locus-specific model each site which has been found in the project area as a result of the literature search was described in terms of the variables shown on Table 11. When all sites found had been coded by recording the values of each variable for each site, then the median of each variable was computed. It was assumed that the medians of these variables describe an optimal site location within the project area.

The facilities were similarly coded, that is, each facility was described in terms of these same variables. A comparison of particular facility codes against the medians for all sites gives a rough and relative measure of the cultural resource potential of that facility. The closer the facility variable codes are to the medians for all sites, the greater the cultural resourse potential of that facility. The Cumulative Distance Score (CDS) is a relative measure of the distance between any facility and the median for all sites. The actual computation of the CDS involves summing up the differences for each variable between the facility codes and the medians for all sites.

It was also possible to determine which of these variables are better predictors of cultural resource sensitivity than others. To this end, histograms of the distribution of each of the variables for all known sites were constructed and by examining the height and breadth of the curve, it was possible to discriminate between good and poor predictors variables.

Distance to nearest water:

Value	Code
Greater than 1 KM	1
500 to 999 meters	2
400 to 499 meters	3
300 to 399 meters	4
200 to 299 meters	5
100 to 199 meters	6
less than 100 meters	7

Elevation above nearest water:

Value	Code
More than 80 meters	1
40 to 80 meters	2
20 to 39 meters	3
less than 20 meters	4

Absolute Elevation:

Value	Code
Above 600 meters	1
300 to 599 meters	2
less than 300 meters	3

Topographic Feature:

Value	Code
Level upland area	1
Glaciated upland, low hills	2
Seasonally wet flood plain	3
Swamp, marsh borders, coastal	4
Terraces, bluffs	5
Drained features of flood plains	6

Forest Type:

Value	Code
Conifer dominated	1
Mixed conifer-deciduous	2
Deciduous	3

Soil Type:

Value	Code
Wet soils	1
Glacial sandy soils, good drainage	2
Wet to moderate, drained loams	3

Table 11. Locus-Specific Model Variables

As was the case with environmental variables used in the zonal model, the variables used by the locus-specific model were chosen for their relationship to prehistoric site locations. It is known that prehistoric groups generally prefer well drained, somewhat elevated areas in close proximity to water (Ritchie and Funk 1973; Versaggi 1979).

Absolute elevation was used in this model since it is an indicator of frost lines, temperature and vegetation distribution. It was expected that most of the sites and facilities were at elevations under 180 meters but the variable was used to verify this. However, elevation above nearest water was also thought to be a useful variable in describing site locations.

Research Strategy

Three successive stages of investigation were defined. A flow chart on Figure V-1 details the three stages. Stage I included an initial visit to each facility and a literature and document search of a variety of sources in order to locate previously known sites. In addition research was begun on the culture history, geologic description and ecological sequence of the project area. Based on these various strategies certain facilities were flagged for further investigation. Stage II involved intensive investigation by sub-surface examination of all the facilities which were flagged during Stage I evaluation. During this time environmental and local historical data was recorded which allowed the completion of the three contextual chapters. Stage III consisted of analysis of fieldwork and report preparation. This material is discussed in Chapters 6 & 7.

Stage I

The three activities for the Stage I investigation were the initial visits, literature search, and the physical examination of each facility. These procedures were designed and implemented to determine cultural resource sensitivity and thereby determine which facilities would require further investigation. Each of these three processes is discussed below.

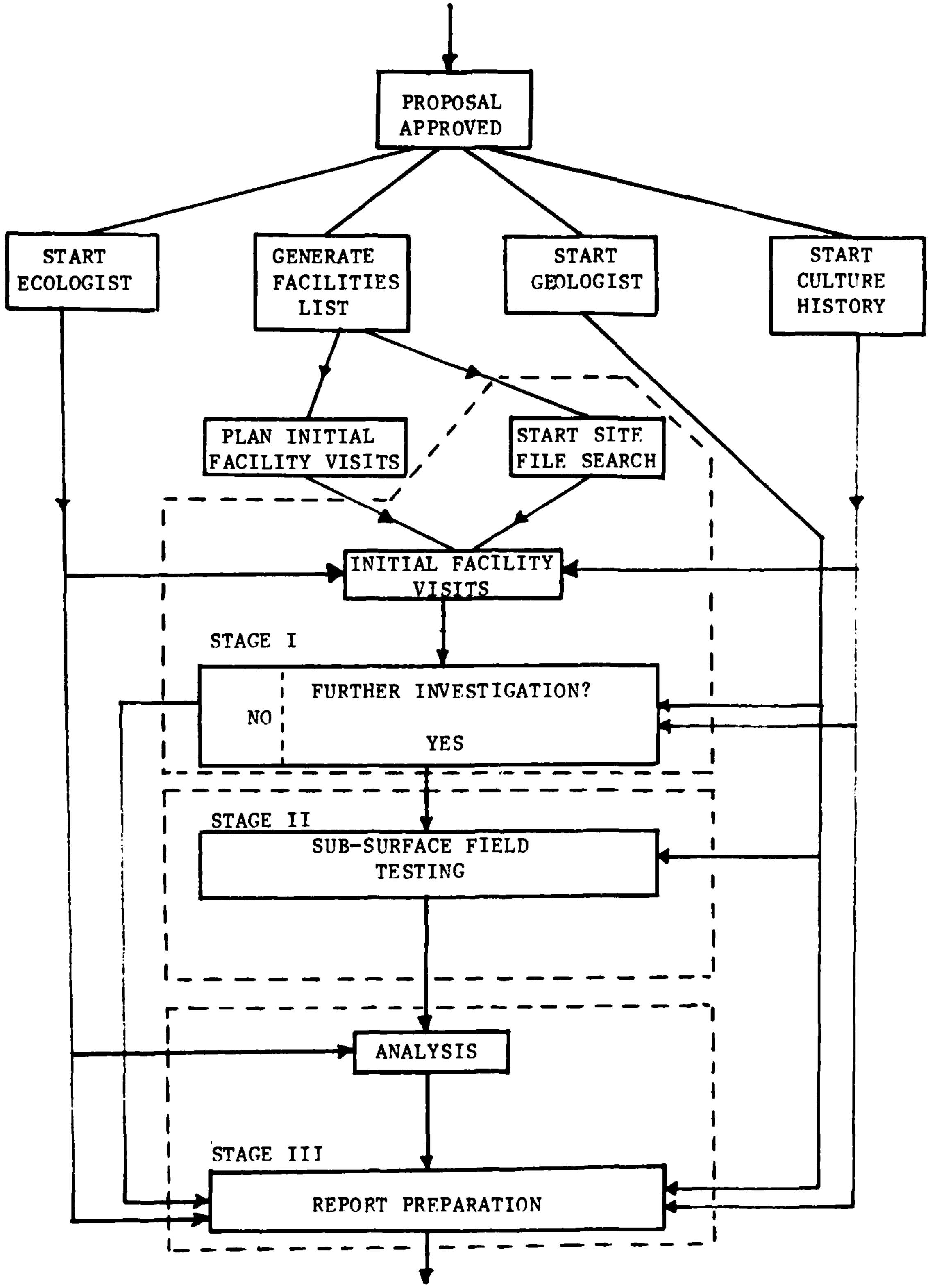


Figure V-1 Flow Chart of Research Procedures

Each facility was given a facility number, ranging from 1 to 69; however certain facilities were removed from the list of those to be investigated, but since preliminary mapping and writing had already been started, it was decided not to renumber the facilities, thus the discerning reader will note several missing facility numbers. Each facility, with the exception of Dexter (68) and Bangor (67), were visited by the Principal Investigator and the Field Director. The visits were made to elicit three kinds of information:

Have any cultural materials been recovered on or near the facility?

What was the prior use of the facility?

How much undisturbed area remains on the facility?

This information was gathered by interviews with knowledgeable persons working at the facility and by physical inspection of the area, and, in certain instances, examination of maps and blueprints. An Initial Inventory Evaluation Form was completed and a photograph taken for each facility. The family housing facilities usually did not have a manager on hand, so it was necessary to rely on the physical inspection and informal talks with residents to gather our information. Dexter and Bangor, because of their great distance from the other facilities, were not visited during Stage I. They were, instead, evaluated by examining facility maps and through discussions with the Real Property Office at Fort Devens, Massachusetts.

The physical inspection included searching for obvious signs of disturbance, such as buildings, paving, and filling and scraping. In most cases, at least one employee at the facility was able to provide this type of information. The conformity of the surface inside and outside the facility was compared, usually revealing if any earthmoving operations had taken place. All this data was recorded on the Initial Inventory Evaluation Form and was used to evaluate the relative usefulness of further investigation.

The literature search was conducted to reconstruct changing settlement patterns and patterns of cultural development in New England from the Paleo-Indian period through the early twentieth century, and to make note of any sites mentioned in the literature which are located near or on the various facilities. Site file research and interviews were conducted in order to obtain preliminary information about prehistoric or historic sites which are known to exist, or to have existed, within or near the various facilities. Contact was made with all the State Historic Preservation Offices in the six New England States, some state archaeologists, historic commissions, public archaeology facilities, universities, the National Park Service, and a variety of local historians and vocation archaeologists. A review of the State Historic Preservation Office (SHPO) site files was conducted for each state within the survey area. A brief description of the data available at the various SHPO's is presented below. Due to the very limited number of

facilities in Maine, Vermont and New Hampshire these offices were consulted by telephone. In general, access to SHPO files was good. Some files were closed to the public and we had to submit copies of quadrangle sheets to the file coordinator.

The Massachusetts SHPO files were up to date and very well organized. Access to these files was relatively easy and their use did not require the assistance of Massachusetts DHP personnel. Known prehistoric sites were located on a series of U.S. Geologic Survey Quadrangle (U.S.G.S.) sheets. In a separate file each of these sites was briefly described and relevant literature and collection holding cited. Historic sites and standing structures were located on a series of U.S.G.S. maps which had been organized by town. For the questions that arose a number of office personnel were available to assist the user. Also available was an up-to-date summary and index, organized by town and author, of cultural resource reports relevant to Massachusetts. Massachusetts has also funded a number of cultural resource planning and evaluation studies which are available for consultation.

The Rhode Island SHPO site files, unlike Massachusetts are closed. Requests for information had to be submitted to the file coordinators. This was done by submitting photocopies of sections of topographic maps on which project locations were indicated. A few weeks later these photocopies were returned by mail. Marked on them were all sites and structures within or near the project areas, along with a brief description of their characteristics. Also available at this office were a number of inventories of selected districts and buildings in various Rhode Island towns.

The Connecticut SHPO files were in the process of being organized. Information which will eventually be keyed to U.S.G.S. topographic sheet locations has not yet been plotted. Therefore, determining whether known sites or structures were within or near project areas was very time consuming. It is also possible that some known sites could be inadvertently missed because of the lack of central files. Because of this situation photocopied maps of the facility and its surroundings, taken from the U.S.G.S. sheets, were submitted to the file coordinator, who reviewed and collected all of the information in their files and plotted them on the maps.

An important approach, which is now being adopted by coordinators of site files, involves keeping track of sites in addition to keeping track of areas which have been surveyed. Several states use county maps on which areas surveyed are marked off, with different colors for the different types of surveying intensity. The maps actually indicate the size and shape of the surveyed areas so that there is no need for duplication and no danger of missing unsurveyed areas. In summary, the data base is fragmented and the project area has been unsystematically surveyed. Surveys of urban and suburban areas predominate while rural or undeveloped areas are substantially under-represented. Some states indicate sensitive areas although no surveys have been done there. The

basis for such a rating is not always clear, although in many instances it is based on amateur work which has not been verified. More emphasis seems to be given to historic districts than other kinds of sites. There are at least two major sources of site files in each state, the SHPO and the universities. Some states maintain a state archaeologist, or a state education department where additional information is kept with varying degrees of availability.

Reported archaeological sites within a 3.2 kilometer diameter circle centered on the facilities, and standing structures on or adjacent to facilities were plotted on the facility topographic quadrangle sheets. These sites are listed in Appendix IV. The presence of a site was used as an indicator of cultural resource sensitivity and as an indicator that other sites might be expected. However, we must emphasize that a lack of sites in certain areas should not necessarily lead to the conclusion that those areas are of low sensitivity since many areas in New England have not been systematically surveyed.

Each facility was evaluated in terms of the data recovered by the procedures outlines above. A facility was recommended for further investigation if any of the following critera were satisfied:

1. Cultural materials were previously recovered from areas within the facility;

2. There were significant amounts of undisturbed surface area within the facility;

3. There was evidence of the possible presence of historically significant structures, or remains of structures, either now, or in the past, on the facility;

4. The facility is a participatory part of an Historic District.

Facilities that failed to meet any of the criteria listed above were not recommended for Stage II investigation. The term "significant amounts of undisturbed area" excludes the four or five foot right-of-way along fence lines and the small strips of possibly undisturbed surface between adjacent buildings. There probably is a square meter here or there of undisturbed area scattered throughout every facility but it would not be within the intentions of the proposal, or within the allowances of the contract, to test each of these scraps of ground.

Family housing areas presented a special problem. Usually all units within any housing area were built at the same time. This means that the entire lot was cleared, leveled and excavated for foundations, and then the buildings were constructed. This process usually disturbed the entire area. In addition, even non-utilized areas were landscaped, and the installation of leachfields or cesspools, water, gas and phone lines, and sewer pipes adds to the total disturbance. Therefore, with the exception of one facility, family housing areas were not recommended for

further investigation during Stage II. The data for evaluating facilities for amounts of undisturbed area came primarily from the initial visit, while evidence for criterion four was gathered from the literature search, especially the State Historic Preservation Offices.

The most important factor for excluding a facility from further investigation was the lack of undisturbed surfaces. Four kinds of disturbance were recognized and are shown in Table 12. Other impediments, although not disturbance in the traditional sense of the word, were standing water, erosion and lack of soil deposition due to natural causes.

Code	Type	Description
0	None	No apparent disturbance
1	Surface I	Grading, soil removal, scraping, filling, occasional buried gas, water, electric and sewer lines. The original surface is visible.
2	Surface II	The surface is paved. Parking lots, light duty roads, railroad tracks, storage areas.
3	Intense	Total disturbance of original surface. Buildings, launchers, buried septic tanks, leach fields, underground storage tanks, heavy duty roads, gun emplacements, footings, impact areas.

Table 12. Disturbance Types

Testing methods were primarily a function of disturbance and a function of cultural resource sensitivity. Sensitivity was either high or low, depending on environmental conditions such as elevation, topographic features, drainage and distance from water. Areas of high sensitivity were the adequately drained areas of floodplains, river, lake and swamp borders, bluffs overlooking floodplains, old beach lines and other slight elevations on these basic features. Areas of low sensitivity include glaciated uplands, steep slopes, wet or poorly drained locations, and areas of thin and acidic soils. In addition, the presence of cultural materials was considered in the determination of cultural resource sensitivity.

Based on these factors, three testing methods were recognized:

(1) No testing

(2) Low

(3) High

The actual determination of testing method is illustrated in Table 13; sampling densities are given in the cells for each level of sensitivity and disturbance among the columns and rows.

		DISTURBANCE TYPE 0	1	2	3	4
CULTURAL RESOURCE SENSITIVITY	HIGH	High	Low	No Test	No Test	No Test
	LOW	Low	No Test	No Test	No Test	No Test

TABLE 13: Determination of Testing Methods

Stage II.

The primary method of Stage II investigation was the subsurface examination of undisturbed areas by shovel testing. The test pits were at least 50 cm in diameter, with a minimum depth of not less than 80 cm. Contents of each shovel test were carefully hand sorted by at least two crew members. If test pit was less than 80 cm., it was for one of the following reasons:

(1) Ground water
(2) Bedrock
(3) Evidence of modern disturbance down to 80 cm
(4) Sterile layers

The identification of sterile layers was based on the geologist's report. The geologic history of the project area suggests that lacustrian sands are basal in the soil stratigraphy and represent sterile layers. In addition, glacial deposits such as glacial gravels and varved clays were also considered sterile.

For the low density testing method areas, a 50% stratified sample was chosen to be tested with a 50 meter spaced grid or transects of shovel tests. The stratified sample was constructed to sample

proportional amounts from each major ecozone recognized on the facility. The 50% stratified sample was developed by totalling the amount of area which is testable in terms of the criteria discussed under the Stage I methodology. The testable area was examined to determine if different types of topography, soils or vegetation zones existed in the area. Half the acreage of the testable area was then chosen which reflected the same topographic and edaphic make up as the total testable area. For instance, if the total testable area was 81,000 sq. meters with 20,200 sq. meters (25%) a damp deciduous wood and 60,700 (75%) a level, sandy bluff, then the 50% stratified sample would be 10,100 sq. meters of damp woods and 30,000 sq. meters of sandy bluff, totaling 40,500 sq. meters, or 50% of the total testable area. In addition, the crew chief or field director placed additional test pits in sensitive areas that may have been passed over by the grid or transects. For computational purposes, the test pit density can be expressed by the following formula where AR = the area to be tested in square meters, and N = the number of test pits:

$$N = \left(\frac{AR}{50} + 1\right)^2$$

N should never be less than five. The formula to determine the number of test pits to be dug was only an approximation because the shape of the area to be tested determined the actual number of test pits required. Square areas require less test pits, while elongated areas require more. Fifty percent of areas designated for the low testing method were examined with the 50 meter grid test pit method. The remaining 50% were sporadically tested as time and circumstances allowed. In these areas test pits were placed by the crew chief to examine areas of higher potential, to pinpoint disturbed areas and to provide stratigraphic control. This method also allowed for at least a superficial look at areas that would otherwise not be examined at all. Test pits from this latter method were separated from other test pits for quantitative purposes.

The high testing method is similar to the low testing method described above, except that instead of testing a 50% stratified sample, the entire area was examined. A test pit record was filled out for each test pit dug. The Field Director issued blocks of test pit numbers to the crew chiefs who, in turn, gave them out to crew members and posted them on the facility map to show their exact location. A Facility Evaluation Form was also filled out for each facility tested under the Stage II investigation. At the discretion of the crew chief or the Field Director certain areas were not tested if new evidence of disturbance came to light. Movable artifacts were bagged and appropriately labelled to reflect as much provenience information as possible. Fixed artifacts (foundations, hearths, storage pits) were to be sketched and photographed. If cultural materials were found in a test pit, four additional test pits, 10 meters distant from this original, were placed.

The 50 meter test pit interval appears to be an acceptable compromise between logistical constraints and desirable coverage. Explicit

recognition of the general patterning of the archeological record allows test pit intervals to be varied so as to allow field location of a representative sample. (Schiffer & Gumerman 1977:204) For example, a large area can be covered rapidly using a large test pit interval. Then, a portion of the area surveyed may be chosen for more intensive survey according to the number of sites located. Mahlsted and Deblasi (1977) utilized a 17 meter test pit interval at Fort Devens but found no sites. This would suggest that, either all sites in this area are extremely small, which is unlikely based on evidence from other studies (Dekin 1978; Schiffer & Gumerman 1977), or that this area has an extremely low sensitivity with respect to prehistoric site location. A 1978 study (Dekin et al 1978) of a ten county area in Arkansas, described the following patterning: a minimum of 24.3% of the sites were less than 550 sq. meters in diameter and the remainder were larger than 550 sq. meters. The utilization of a 50 meter test pit interval in this situation will discover 100% of the larger sites, while at least 18% of the smaller sites will be found. Of all site sizes, at least 78.9% of them should be found with a 50 meter test pit interval. It should be noted that even with a 10 meter test pit interval that many sites, specifically those whose diameter is less than 10 meters, will be missed.

The findings of Mahlsted and Deblasi, as well as our own predictions, the anticipated low prehistoric sensitivity of the project area did not justify the technique of screening. Handsifting was felt to be sufficient in this situation.

Historic properties and standing structures were evaluated on an ad hoc basis. Schoss (1978) had already performed such an evaluation for Ft. Devens. His results are discussed in Chapters 6 and 8.

CHAPTER 6

RESULTS AND FINDINGS

This chapter presents a discussion of the results of the Stage I and Stage II investigation of each facility. For a more detailed description and analysis of each facility refer to the pages following this initial discussion. Before each facility is discussed individually, some general findings will be presented.

None of the 1448 testpits dug produced any indications of prehistoric activity. One unmodified flake was found on the surface of the paved driveway of Building T-90 at the Hingham facility. Testpits dug in this area failed to reveal any other materials. No diagnostic historic artifacts were recovered. Some twentieth century ceramics were found, usually in connection with filled areas. The foundation at the Bridgeton facility turned out to have been built in 1927 and is thought not to be significant in terms of criteria established by the National Register of Historic Places. Two partial foundations were found at Fort Devens.

Briefly it may be said that the most important reason that no potentially significant cultural material was located is due to the fact that the amount of disturbance was much greater than was anticipated. The areas which were originally designated for sub-surface testing were thought to represent the only undisturbed areas on the facilities. When these designated areas were found to be disturbed, there usually were no alternate areas to move to. (See individual discussions of facilities given below). A section of Fort Devens, which in 1977 had been identified as a highly sensitive area, was tested by Mahlsted and Deblasi (1977) in that year in preparation for construction of a sewage treatment plant; however, no materials were recovered. Their testing procedure spaced sub-surface shovel tests at 17 meter intervals yet nothing was found. They explained this fact by citing previous surface disturbance which apparently had not been recognized during initial evaluation, and erosion of possible culture bearing strata. Their re-evaluation, as has ours to a degree, downgraded the cultural resource sensitivity of some areas from high to low (Mahlsted and Deblasi 1977).

In the discussion of each of the facilities below, the areas tested and not tested will be described, as will any changes made in the testing methodology outlined in the Stage I evaluation. The composite soil profile for each locus was derived from the combined test pit stratigraphies for the area. Where localized differences occur, they will be discussed individually in the text. Also included in each facility evaluation is the score for each facility based on the zonal and locus-specific model. Further descriptive information for each facility, such as date of acquisition, function, etc. can be found in Appendix II.

Facility Name: Fort Devens
Facility Number: 1
Level of Investigation: Stage II
Disturbance Type: 0, 1, 2, 3, 4
Cultural Resource Sensitivity: Low, High
Contact: Mr. R. Winters (617) 796-3293

Fort Devens is an active military installation located in the Townships of Harvard and Ayer, Massachusetts. The total size of the facility at this time is 38 sq. kilometers. The most important function the post serves now is as headquarters for the US Army Intelligence School. In addition, it is the focal point of the Army Reserve activities in the five New England States. A large part of the post, referred to as the South Post or the South Range Area, is a training area including airborne training facilities for the 10th Special Forces, a "drop zone" or parachutist landing area, tank, mortar, recoilless rifle and rocket ranges, and a wide variety of small arms training facilities. Also included are facilities for chemical warfare training and for the disposition of unexploded or unwanted ammunition. At the northern part of the post is located an airfield and helicopter landing area used in conjunction with parachutists' operations. This Main Post is primarily used for administrative and educational buildings associated with the U.S. Army Intelligence School and the Post headquarters, a hospital, barracks, recreational facilities including a golf course, a landfill and the other various ancillary structures which make a military installation of this size essentially self-sufficient.

One prehistoric site is located within two kilometers of the facility. Site 1-3 is located overlooking a swamp and creek south of Route 2, 100 meters west of the Boston and Maine Railroad tracks. It is believed this site was destroyed during an enlargement and realignment of State Route 2. Other prehistoric sites, 1-2 and 1-9 are located over two kilometers to the east and south on higher and better drained ground overlooking wet areas. The environmental zone of these areas is markedly different from that of Fort Devens. Eight historic sites FD-21 through FD-28 are located at the early settlements in the area in Shirley, North Lancaster and along the Lunenberg Road. None of these sites are located on Fort Devens.

Standing structure and the history of buildings in general was investigated by Captain George Shott in 1978 and his findings were published in that year. Included in his survey was a picture and brief history of most of the buildings on the Main Post at Ft. Devens. In addition to contemporary photographs Capt. Shott published some older photographs which were taken soon after construction of some of the buildings. We consider his study of the buildings on Ft. Devens adequate and we did not duplicate his efforts. The only buildings not investigated by him are the newer family housing units built in the 1950s.

Based on Shott's evaluation (Shott 1978) and our own verification, we do not consider any standing structures at Ft. Devens to meet National

Register criteria. Many of these buildings have been extensively modified during their history as their function changed. For instance, the Officer's Club was originally a residence. During its conversion to the Officer's Club it was extensively modified, turning many small rooms into a few large ones, installing a large kitchen, bar and other facilities. Likewise, the Post Museum was built as a stable in 1932. Only the shell remains intact, the inside has been totally renovated with display cases and several offices.

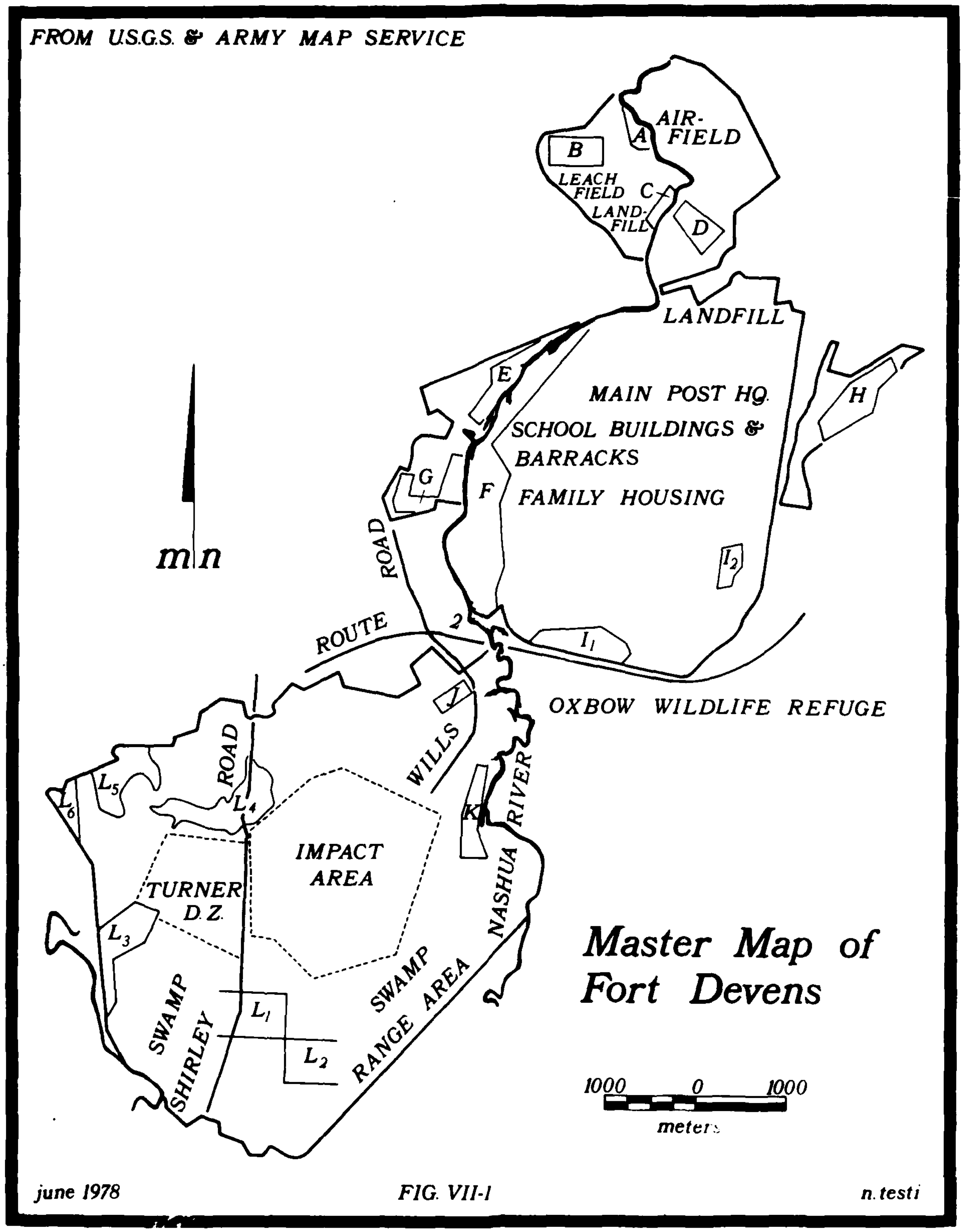
The oldest standing structures on Fort Devens date from the World War I period (Shott 1978). Eight buildings were built in 1917; they are, with the exception of a brick heating plant and a brick electrical substation, clapboard frame buildings of utilitarian use, such as living quarters, garages and warehouses. Two buildings were built in 1918; they are the Officer's Club and the Provost Marshall's Administration building. The former is frame and clapboard while the latter is brick. These structures have already been inventoried and described (Shott 1978).

For descriptive purposes the facility has been divided up into fourteen areas, A through L. These are potentially undisturbed areas which were tested by sub-surface examination. These areas were evaluated and tested as outlined in Chapter 5.

Fort Devens is situated in an area of glaciated terrain. There are two major topographic zones present. The first, which is located on the Main Post and the airfield (areas A through I), is moderately level and sandy, bordering the Nashua River. This area is a remnant of glacial Lake Nashua. The higher elevations are well drained, while the lower elevations are poorly drained. Since the clay content of the soil is fairly low, the poor drainage is accounted for by the underlying shale/slate bedrock. The second zone, which encompasses the majority of the South Range Area, is hillier and at higher elevations. The hills here are glacial till and mark the southern limit of Lake Nashua. The soils are lacustrian sand, slightly acidic and podsolized.

Although Dincauze regards this general area as one of high prehistoric sensitivity, there is little actual evidence of any sites in the area. A prehistoric site is located adjacent to Fruitlands, but that part of Fort Devens has been disposed of and is no longer under military control. The only other hint of prehistoric activity is in area K on the G range, a "known distance" rifle range. A local collector gathered artifacts here in the 1940s but the collection has been lost. It is feared that the site was destroyed when the G range was levelled.

The surface collection at the Fruitlands was examined by the archivist during his visit there but it shed little light on the prehistory of Fort Devens. Historically, traces of the seventeenth century settlements in the area have totally disappeared. The post-Revolutionary War settlement consisted of scattered farming homesteads. Many of these that remained into the twentieth century were used as


FROM U.S.G.S. & ARMY MAP SERVICE
AIR-FIELD
A
B
LEACH FIELD
C
LAND-FILL
D
LANDFILL
E
MAIN POST HQ.
SCHOOL BUILDINGS &
BARRACKS
H
G
F
FAMILY HOUSING
ROAD
I_2
m n
ROUTE 2
I_1
J
OXBOW WILDLIFE REFUGE
WILLS
ROAD
L_5
L_6
L_4
K
RIVER
IMPACT AREA
TURNER D.Z.
NASHUA
L_3
Master Map of Fort Devens
SWAMP
SWAMP
RANGE AREA
L_1
SHIRLEY
L_2
1000 0 1000
meters
june 1978
FIG. VII-1
n. testi

artillery targets when the South Range area was first utilized for those purposes just prior to World War II.

Major disturbed areas are the airfield and sewage treatment plant on the North Post, the central "urbanized" core of the Main Post, the ammunitions storage magazine, landfill, hospital, golf course, artificial lakes, housing, old rifle ranges and sand pits on the Main Post. On the South Range, the impact area and the Turner Drop Zone and the various weapons ranges are the disturbed areas. Untestable but undisturbed areas are the swamps along the Nashua River on the Main Post and the Airfield and a large swamp along the southeastern edge of the South Range. Localized wet areas are scattered throughout. Several ponds, some of them artificial, are also located on the South Range.

As is the case with many of the other facilities examined during Stage II, there is more disturbance here than was originally suspected at the end of the Stage I procedures. That is as it should be, according to the conservative approach that was taken to diagnose the degree and type of disturbance, since it is much better to test an area that might be disturbed than to pass up an area that may not be disturbed. Most of this undiscovered disturbance occurred several years ago and new soil covering, because of deposition or new soil building due to root action, disguised this disturbance until the ground was opened up. The cultural resource sensitivity of many areas was also probably too high, which again is the result of conservative evaluative techniques.

Dincauze has predicted that the Fort Devens area in general is one of relatively high prehistoric sensitivity (Dincauze and Meyer 1971) yet there are few sites reported from the area. The lack of sites in an area which has previously been determined to be of high cultural resource sensitivity can always be explained as a sampling problem, that is, insufficient survey coverage of the area. However our investigation, which was designed expressly to be systemmatic and to sample all types of areas with equal rigor, also failed to produce any evidence of prehistoric activity. Although no sites are found in an area of high cultural resource sensitivity it does not automatically follow that either the research procedures or the sensitivity evaluation are incorrect. A statement of significance is a statement of probability. There is no guarantee that every high sensitivity area, no matter on what variables that evaluation was based, will contain sites. The obverse is also true, low sensitivity areas will at times contain sites.

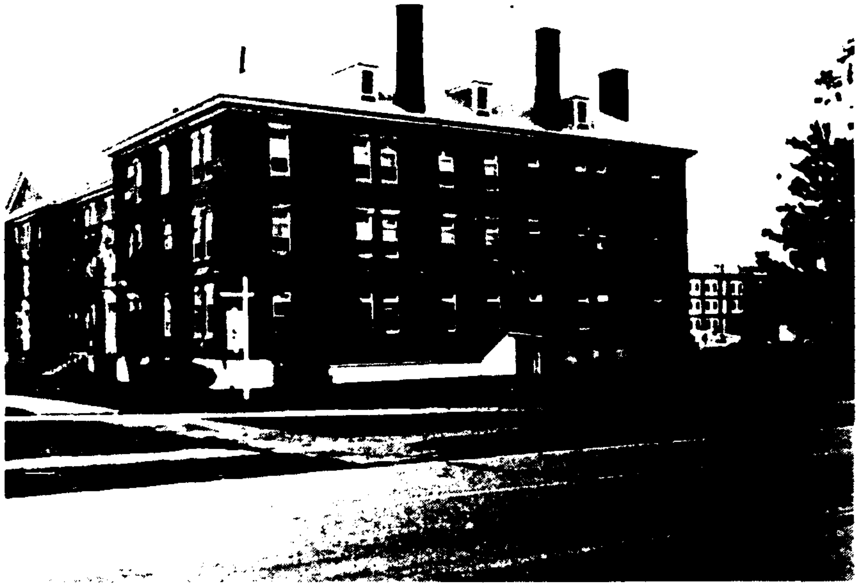


Plate 4: Facility 1, Headquarters Complex, Fort Devens, Mass. The headquarters complex on the Main Post at Fort Devens, Massachusetts.

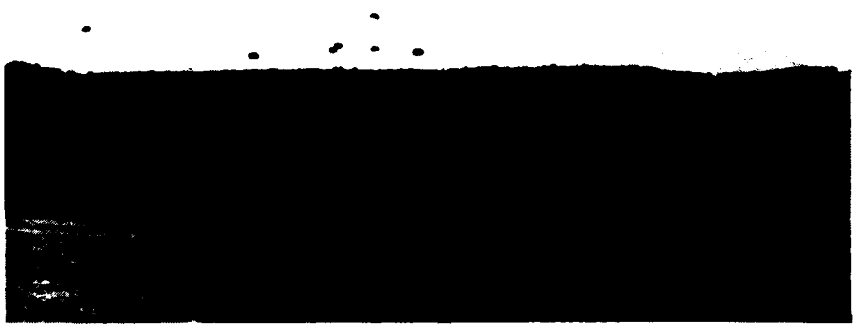


Plate 5: Facility 1, Turner Drop Zone, Fort Devens, Mass. Area L.

Fieldwork at Fort Devens

A total of 964 testpits were dug to test 3,615,700 square meters, or 4.7 sq. kilometers, of testable area. The 886 acres actually tested represent 12.2% of the fort's 38 sq. kilometers. When the different sampling strategies are taken into consideration then the actual amount of area examined adds up to 6,586,700 square meters, or 1627.6 acres, which represents 17.3% of the total area of Fort Devens. No prehistoric cultural materials were found at Fort Devens. Parts of two foundations and a small amount of glass, bricks and undiagnostic ceramics were found in area L2.

The foundations are probably remnants of houses destroyed when the South Range area was acquired by Fort Devens. The Post Historian told us that many of the houses thus acquired were used as artillery targets (May, Personal Communication). There is also evidence that some of the foundations were dismantled and that the stone was used to build fox holes and machine gun positions. An archival check of this area turned up no significant information. Each of the areas tested at Fort Devens will be discussed individually below. Table 14 summarizes the test area.

Area	Number of Testpits	Acres	Square Meter	Testing Method
A	16	5.5	22,500	High
B	60	29.5	120,000	Low
C	12	3.2	13,200	High
D	8	2.1	8,500	High
E	15	12.4	50,500	High
F	205	90.8	370,000	High
G	16	5.6	23,000	High
H	19	6.9	28,000	High
I1	39	11.0	45,000	Low
I2	21	5.9	24,000	High
J	39	17.7	72,000	Low
K	82	292.0	119,000	High
L1 and L2	311	333.3	1,358,000	Low
L3 thru L6	121	334.2	1,362,000	Low

TABLE 14: Test Areas at Fort Devens.

(Refer to Figure VI-1 for a general reference to Fort Devens and Figures VI-2 through VI-13 for specific location of the test areas.)

Area A. CDS: 6.4 ZES: 14.5

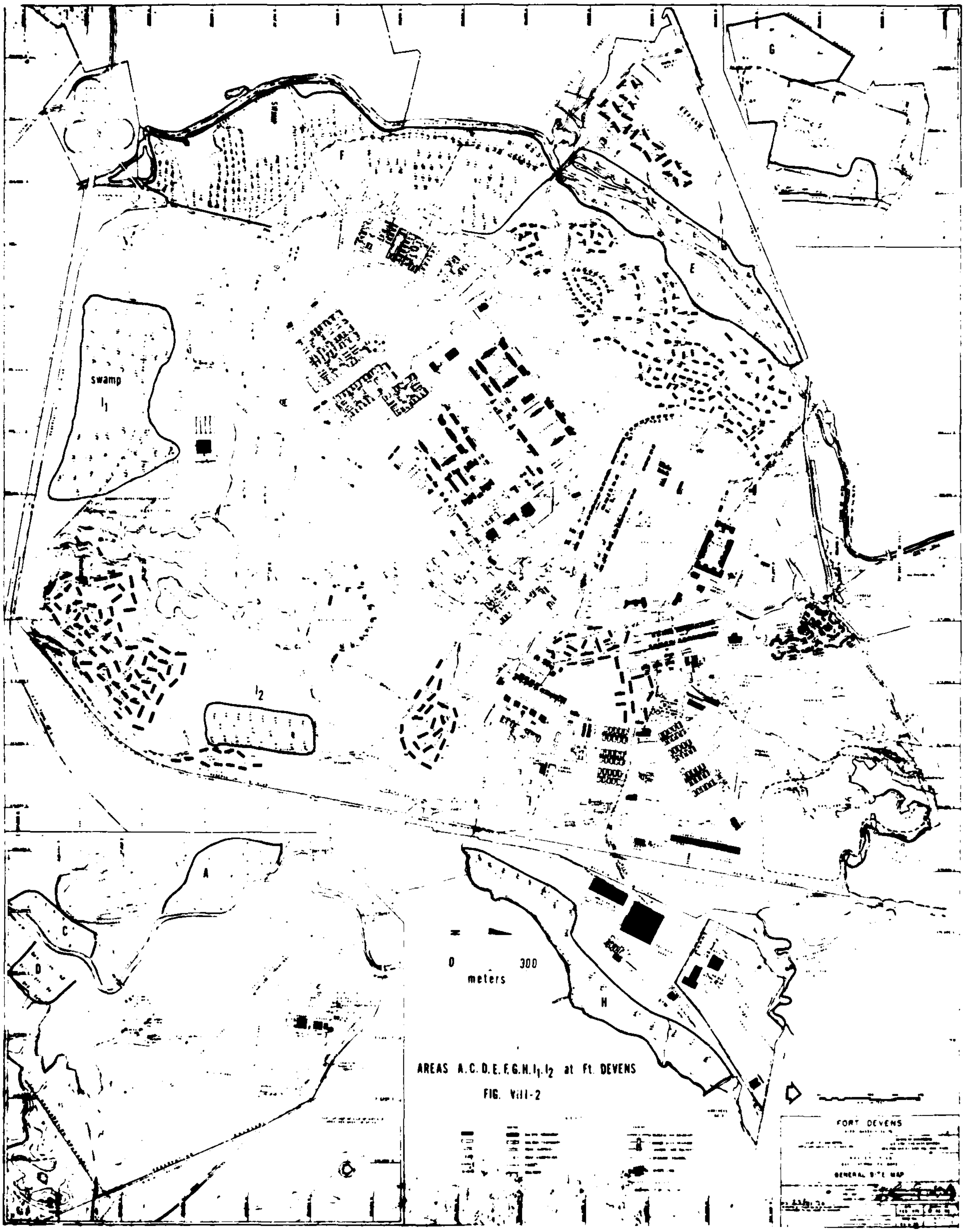
Area A is located on the North Post, west of the airfield. There are approximately 22,500 square meters of undisturbed area on the west bank of the Nashua River. The east bank has been disturbed by construction of the runways which have been built up 15 meters above the poorly drained floodplain. West of area A the terrain rises into the glaciated uplands in back of the leach field and into area B. Area A is divided by a swamp which drains into the Nashua by an artificial channel. It appears that the swamp was larger before the drainage channel was built.

Sixteen testpits were dug in two sets of two rows north and south of the marsh (see Figure VI-2A). No cultural materials were found. The composite soil profile indicates that the sediments here are from the seasonal flooding of the river. These sediments would hide any evidence of previous disturbance.

0 - 40 cm. - Fine gray/brown silt.
40 - 100 cm. - Light brown/gray silt.

Some of the testpits reveal glacial sands (yellow, with unsorted gravels) at 80 to 110 cms. Some testpits showed very wet lower strata. The vegetation here is grass meadow with areas of swamp vegetation and small areas of mixed deciduous and coniferous woods.

Plate 6. Facility 1, Area A, Fort Devens, Mass.



AREAS A. C. D. E. F. G. H. I_1. I_2 at Ft. DEVENS

FIG. VIII-2

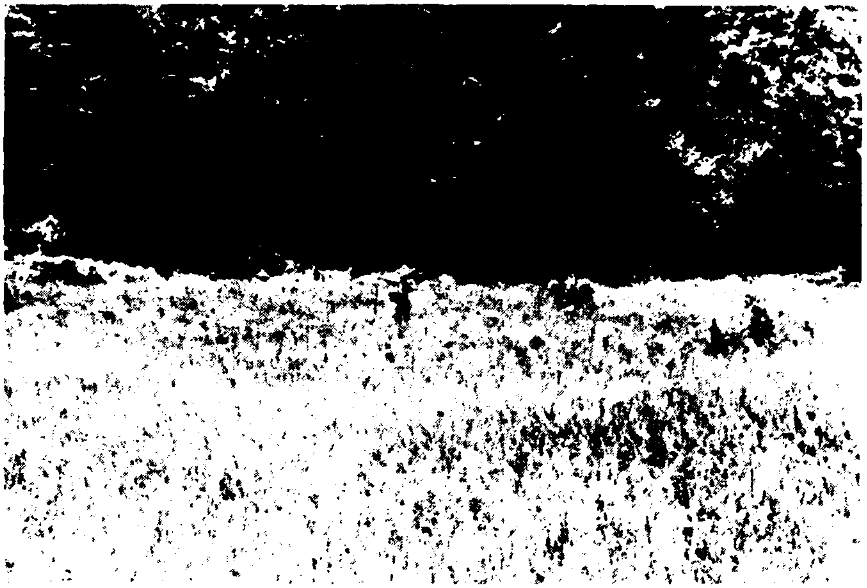


Plate 7. Facility 1, Area A, Fort Devens, Mass. The flat area in area A, north of the marsh and west of the Nashua River. The wooded area in the rear is a slope leading up to Area B.

Area B. CDS: 13.0 ZES: 13.0

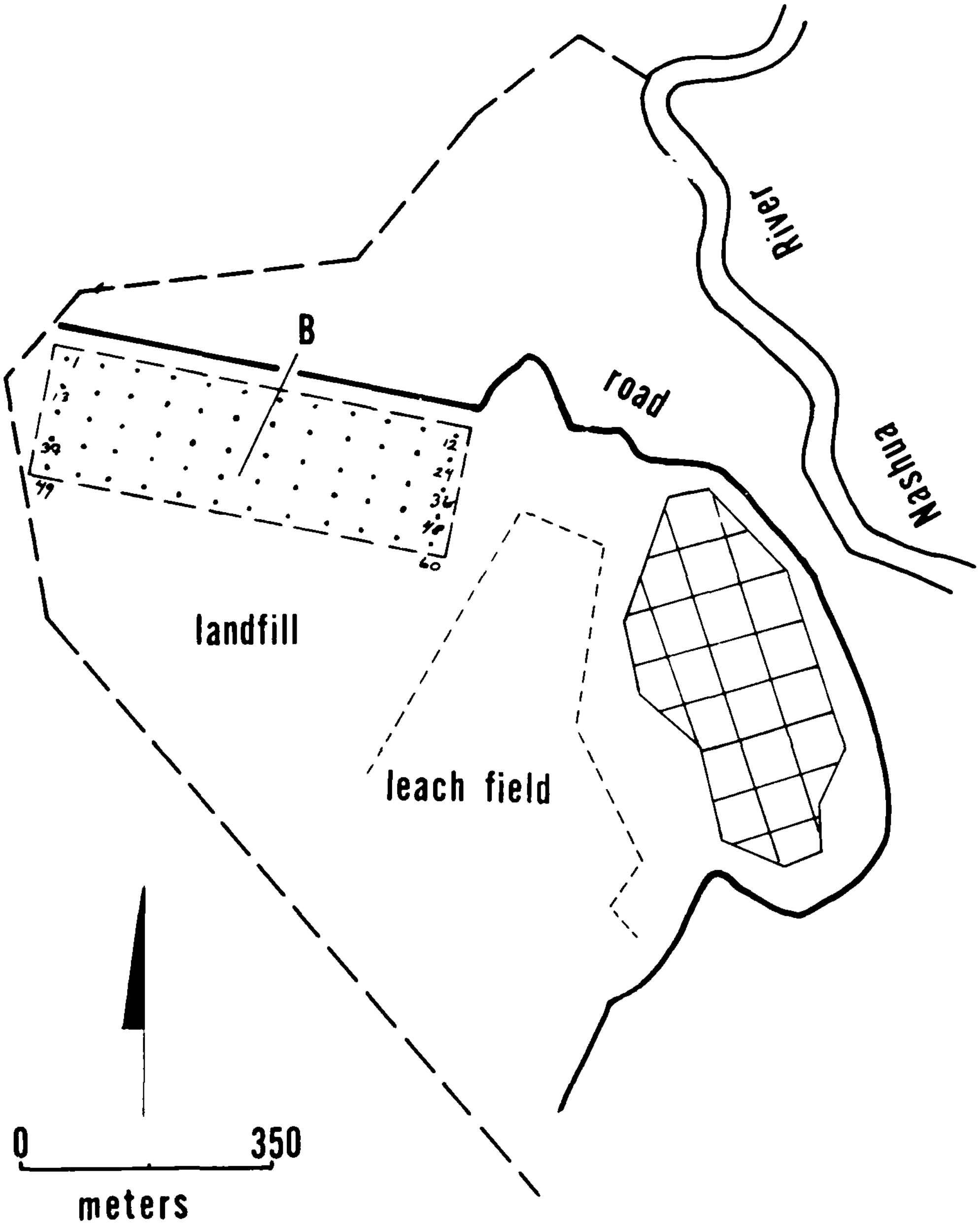
Area B is located on higher ground to the west of area A. (See Figure VI-1 and Figure VI-3). The total testable area here is approximately 240,000 square meters, of which half was tested with 60 testpits. This area was used as a training and bivouac area. It is criss-crossed with tracked vehicle roads and there is some evidence of earth moving operations. An abandoned landfill dominates the southern part of area B. The northern part is a steep, east running slope down to the swampy flood plain of the Nashua to the east in area A. The actual area tested runs south to the northern most east-west access road. No cultural materials, except rifle shells, were found. Pieces of lumber, machine made nails, and water pipe were found in several testpits at depths of 0 to 30 cm. The topography of this area is characterized by a flat, elevated glaciated plain overlooking the floodplain of the Nashua River. These acidic glacial soils support a primarily coniferous forest with small hardwoods, such as oak, at the clearing borders. The soils here are quite different from area A, and are described below:

0 - 15 cm. - Dark brown humic sand, with gravel and cobbles.
15 - 50 cm. - Yellow and tan sands, some gravel.
50 - 100 cm. - Gray, white, yellow sand with some clay and lots of glacial gravels. Hard pan and gravel lenses stopped some pits between 60 and 80 cm.

Plate 8. Facility 1, Area B, Fort Devens, Mass. A training area in the pine woods. Note the bleachers.

Plate 9. Facility 1, Area B, Fort Devens, Mass. Road and vehicle exercise area in the woods.

Plate 10. Facility 1, Area B, Fort Devens, Mass. The pine woods in area B. Note stumps of cleared trees to allow vehicular access.



AREA B AT FORT DEVENS

june 1979 FIG. VII-3 n.testi

Area C. CDS: 6.4 ZES: 16.5

Area C is also located on the North Post. It is actually a southward extension of area A, the two being separated by disturbed zones. Just over 13,000 square meters were tested with twelve testpits. No cultural materials were found. The soil stratigraphy is identical to that of area A. The riverine silt has been stained by root action and humic development down to a depth of approximately ten centimeters.

0 - 10 cm. - Brown or gray humic sand.
10 - 100 cm. - Brown-gray sandy silt.

There is almost no gravel. Some pits reach yellow sand near 100 cm. This area is flooded every spring, sometimes as much as 2 meters above normal river level. The northern and southern end of area C are delimited by abandoned rifle ranges. Much earth moving has taken place on these ranges, presumably to improve the drainage so that they could be used year around. The vegetation is similar to area A, with many open areas and maples, birches, some conifers, ferns and water tolerant grasses.

Plate 11. Facility 1, Area C, Fort Devens, Mass. One of the many dirt roads crossing areas A, B, and C.

Plate 12. Facility 1, Area C, Fort Devens, Mass. The Nashua River from area C.

Area D. CDS: 5.0 ZES: 16.0

Area D overlooks the swampy floodplain of the Nonacoicus Brook, a tributary of the Nashua River. It is located east of the main access road, just south of the airfield. This area adjoins the site of the sewage treatment plant area which was surveyed by Mahlsted and Deblasi (1977). Because of the negative results of the more intensive previous survey this area was only spot tested. There is some localized disturbance in the form of sand pits and dirt roads. Much of the untested part of area D is an abandoned rifle range and several small cleared training areas which are scattered on dry ground. The drainage in the area is varied, high areas being very dry and low areas being quite wet. Approximately 8500 square meters were tested with eight testpits. No cultural materials were discovered. There are two types of soil profile, revealing layers of clay, silt and sandy silt. Surface disturbance is evident in some areas by the repetition of humic and B zone layers starting below 40 cm. Soil profile A supports deciduous trees and ferns, and is located at lower elevations. Soil profile B supports conifers and is on higher ground overlooking the lower wet areas.

Soil profile A:

0 - 20 cm. - Dark brown silty humus.
20 - 100 cm. - Gray silt, water after 80 cm.

Soil Profile B:

0 - 24 - Humic sand.
25 - 100 - Orange, tan sand.

Plate 13. Facility 1, Area D, Fort Devens, Mass. A small training area, in the form of a sandbagged small arms position, in a cleared and level area.

Area E. CDS: 8.4 ZES: 13.5

Area E is located on the Main Post on a steep 18 meter high slope overlooking the Nashua floodplain. Although the slope is steep there is a terrace, perhaps an old beach line, which was tested. The flat top of the slope has been disturbed by a housing development, a swimming pool and trailer park. Fifteen testpits were dug along the terrace going down to the Nashua. No cultural materials were found. The floodplain is covered with a riverine silt which is probably the result of seasonal flooding. The water table is only fifty centimeters below the surface of the terrace, which is dotted with small localized swampy areas. The southern end of the slope is disturbed by a storm sewer which is eroding the bank away. (See Plate 15). Two general soil profiles were found. Profile A comes from the higher, rear parts of the terrace and the testpits dug here did not hit water. The sediments appear to be glacial.

Soil Profile A:

0 - 20 cm. - Rich organic humus.
20 - 60 cm. - Sandy yellow/tan silt, some cobbles.
60 - 100 cm. - Orange sand with cobbles.

Soil profile B: (from the lower, damper areas):

0 - 5 cm. - Thin humic layer.
5 - 50 cm. - Grayish yellow silt, few rocks, water in testpits after 50 cm.

Plate 14. Facility 1, Area E, Fort Devens, Mass. Disturbance along the top of the slope.

Plate 15. Facility 1, Area E, Fort Devens, Mass. The storm sewer eroding the slope at the southern end of area E.

Area F. CDS: 3.6 ZES: 180

Area F is the largest and most archaeological sensitive area on the Main Post. It overlooks the Nashua River and is comprised of the upland and slope overlooking the Nashua down to its floodplain. The approximately 370,000 square meters of testable area were examined with 205 testpits. No cultural materials were found except twentieth century trash. Brick fragments were found in testpits 47, 48, and 105 at depths around 10 cm. Localized disturbance took the form of sand pits, a collapsed well, swampy areas and old roads. There were also remnants of fox holes. This was a training area prior to the acquisition of the South Range. Several segments of field stone walls were found along abandoned roads. There was no evidence of any other cultural remains associated with the roads or walls.

The soils and vegetation on the upper slope differ from those on the bottom. On the upper slope the soils are mostly sand supporting a mixture of conifers and hardwoods. In the cleared areas underbrush and hardwoods dominate. Drainage here is quite good. As one works down the slope towards the river the deciduous trees become dominant, the underbrush begins to be made up of water-tolerant ferns, skunk cabbage etc., and the soils become more silty with a relatively high clay content. Drainage is poor along the bottom. The terrain, although appearing smooth and gradual on the topographic map, is quite varigated with many small drainages and intermittent streams dissecting the smooth slope to the river.

The soil profile for the lower testpits is a wet mucky humic layer, riverine silts and then clays. Water was encountered in some testpits at depths of 30 cm. The soil profile for the testpits on the slope, above the floodplain, is given below:

0 - 20 cm. - Dark brown humic sand.
20 - 50 cm. - Tan sand.
50 - 100 cm. - Orange sand, some gravel.

B zone soil development, although not absent here, is somewhat retarded, especially in areas where the drainage is good and where conifers dominate. Some of the upper slope consists of swales and low depressions. Wherever these areas are very moist, deciduous trees will dominate and B zone development will be much more pronounced.

Plate 16. Facility 1, Area F, Fort Devens, Mass. In the conifer and oak woods near the top of the slope. Note the very thin groundcover.

Plate 17. Facility 1, Area F, Fort Devens, Mass. Localized disturbance in area F. Although the dominant trees are hemlock and white pine, shrub birch and oak have invaded cleared areas.

Plate 18. Facility 1, Area F, Fort Devens, Mass. A field stone wall running through the woods. The walls were probably land survey marks or property lines.

Plate 19. Facility 1, Area F, Fort Devens, Mass. A well or pit, stone lined and filled with silt. It has been capped with tar or asphalt.

Plate 20. Facility 1, Area F, Fort Devens, Mass. A swampy area at the bottom of the slope. Note the obviously different forest type.

Area G. CDS: 8.0 ZES: 15.5

Area G is located on the Main Post. It was the site of the old post hospital which once occupied the whole area inside the rectangular road called Lovell Street, and also some buildings across Lovell Street to the south east. One line of testpits was dug from on top of the slope down to the Nashua River, another was run south west along the river and a third group was dug in a flat area to the west. A total of sixteen testpits were dug here. No cultural material was found. Testpits 1 through 3 were placed across the top slope and produced the following composite soil profile:

0 - 15 cm. - Humus.
15 - 20 cm. - Tan sand with gravel.
20 - 40 cm. - Gray-yellow clay.
40 - 55 cm. - Gray orange sand with gravel.
55 - 100 cm. - Gray orange sand, no gravel.

The surface was littered with garbage, wire, concrete fragments and pieces of pavement. The tan orange sand above and below the clay layers suggests filling. Testpits 4 through 10 are located along the lower slope and the floodplain of the river. This area was covered with thick organic debris, followed by silt and clay.

0 - 10 cm. - Humus, with much partially decayed organic matter.
10 - 30 cm. - Orange silt.
30 - 100 cm. - Tan and orange clays, getting lighter at greater depth.

The third group of testpits was dug in the area of a baseball field and an old parking area. It appears disturbed because of the presence of silt on top of sand and gravel some 20 meters above the river. Gravel is very dense in some testpits and absent in adjacent ones. This area appears to have been filled.

0 - 10 cm. - Humus, small pebbles, sandy.
10 - 35 cm. - Yellow silt (Not present in all pits.)
35 - 100 cm. - Tan sand with glacial gravels.

The vegetation on top of the bluff is a conifer dominated forest, except for previously utilized areas which are still open meadow. The lower slope along the river is primarily deciduous trees with swamp vegetations.

Plate 21. Facility 1, Area G, Fort Devens, Mass. Disturbed area on top of the bluff southeast of Lovell Road. The tree line marks the drop off down to the Nashua river.

Plate 22. Facility 1, Area G, Fort Devens, Mass. Old building site at the northern end of area G. The concrete slab on which this building was built is hidden underneath a thin layer of rubble and newly deposited soil.

Plate 23. Facility 1, Area G, Fort Devens, Mass. Looking down towards the Nashua River. The area is covered with old building rubble, crushed foundations and splintered siding.

Area H. CDS: 5.6 ZES: 8.5

Area H is located in a warehouse and rail terminal district at the northeastern end of the Main Post. This area is separated from the Main Post by the Boston & Maine Railroad switching yard. The area is artificially graded and overlooks Cold Spring Creek. Much of this area is devoid of topsoil and may, in fact, be built up. This area has been used for vehicle storage and as a training area for the Massachusetts National Guard. This area is also used to set up mobile radio vans during communications exercises. The undisturbed part of area H is on the very swampy floodplain of Cold Spring Creek. The vegetation is definitely swampy deciduous. Nineteen testpits were dug here but no cultural materials were found. Except for the one testpit dug on the levelled area, all others seemed to be undisturbed. Testpit 758, dug on the high ground, had brown sand from 0 to 100 cm. All other testpits, dug on the slope to the creek and on the few dry places next to the creek bottom, had similar soil profiles.

0 - 20 cm. - Dark, wet humus.
20 - 100 cm. - Tan sand, water enters testpits after 40 cm.

Plate 24. Facility 1, Area H, Fort Devens, Mass. Looking from Barnum Road towards Cold Spring Creek. The creek is 20 meters beyond the treeline in the distance.

Plate 25. Facility 1, Area H, Fort Devens, Mass. Down by Cold Spring Creek in the woods. Note the swampy vegetation.

Area I1. CDS: 2.7 ZES: 20.5

Area I consists of two small areas (Areas I1, I2) in the southeastern corner of the Main Post. In general this area is quite hilly with rather thin soils on the high areas and poor drainage in the low areas. The elevation range is over 30 meters. The level areas are used as housing, a golf course, a large ammunition storage magazine and the new hospital. Previously utilized and disturbed areas include several abandoned sand mines, two abandoned rifle ranges and two athletic fields. Area I1 is located along the southern edge of the Main Post where the high ground slopes down to a large, approximately 0.4 sq. kilometers, swamp on the Nashua River floodplain. This was assessed as an archaeological sensitive area and was extensively tested. Testpits were placed on drained areas or slight elevations which were not excessively sloped. Thirty-nine testpits were dug here, testing approximately 45,000 sq. meters; no cultural materials were found. Localized disturbance was indicated by lenses of crushed brick in several pits between 0 and 40 cm. The vegetation is coniferous on the sandy well-drained slopes and swampy with deciduous trees on the lower wet areas. Testpits on the northern higher side exhibited a different profile than those on the swamp borders.

Soil profile A, upper testpits:

0 - 20 cm. - Black humic sand.
20 - 60 cm. - Tan sand.
60 - 100 cm. - Pale yellow, gray sand with few cobbles.

Soil profile B is from the swamp borders:

0 - 30 cm. - Black humus with partially decomposed organic litter.
30 - 50 cm. - Orange clay with gravel, many testpits hit water after 50 cm.

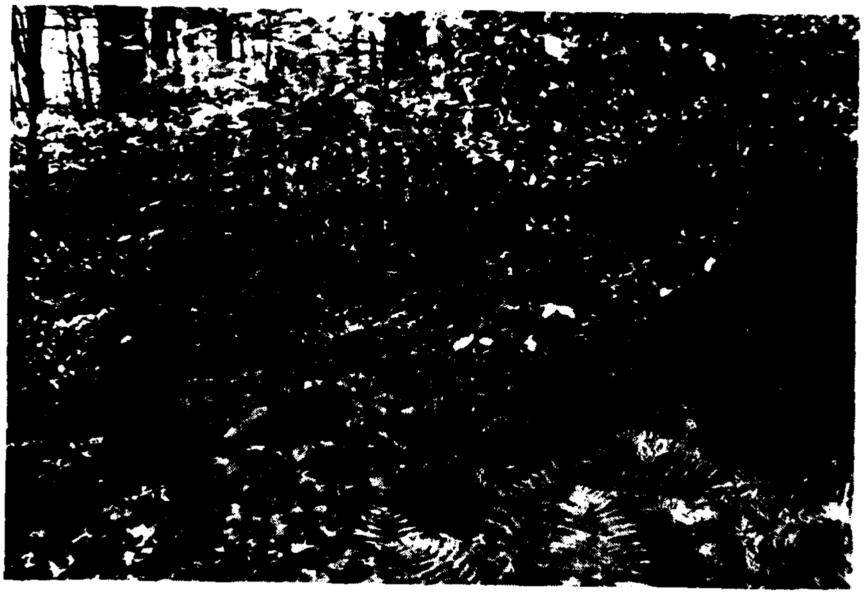


Plate 26. Facility 1, Area I1, Fort Devens, Mass. A deciduous and swampy area south of Sheridan Road.

Plate 27. Facility 1, Area I1, Fort Devens, Mass. A swamp off Sheridan Road. The Nashua River is located 800 meters to the south across this swamp.

Plate 28. Facility 1, Area I1, Fort Devens, Mass. Localized disturbance on a sandy ridge south of Sheridan Road. This area was labelled "KEEP OFF".

Area I2. CDS: 12.0 ZES: 9.5

Area I2 is in the same general location as Area I1, on an east facing slope overlooking an old creek bed 400 meters away. The creek has been diverted to make room for the Boston and Maine railroad bed and Maine Road. This slope appears to be a glacial feature composed of orange sand with gravel. Twenty-one testpits were dug here on 24,000 square meters of apparently undisturbed terrain. The vegetation is primarily coniferous and drainage seems to be exceptionally good. No cultural materials were found. Testpits 1514 and 1517 are located in localized disturbed areas. The composite soil profile is quite uniform:

0 - 10 cm. - Brown humic sand.
10 - 100 cm. - Orange sand with glacial gravel at lower depths.

Plate 29. Facility 1, Area I2, Fort Devens, Mass. Looking up the slope in a typical location in area I2.

Plate 30. Facility 1, Area I2, Fort Devens, Mass. Impact bank of a rifle range. The fill was scraped from the flat area in the front.

Plate 31. Facility 1, Area I2, Fort Devens, Mass. An abandoned sandmine off Patton Road.

The remaining areas are all located on the South Range. The topography here can be broken up into two zones: the northern being a flat, swampy glacial lake bottom while the southern zone is a glaciated upland region with gently rounded hills and localized deposits of till. The soils in both areas are sandy, slightly acidic and moderately podzolized. Forest cover is primarily coniferous in the upper well-drained regions and swampy-deciduous in lower areas. The soils in the southern hilly area are quite stony, probably due to glacial scouring and till deposition. In the northern section lacustrian sands from glacial Lake Nashua are the dominant soil type. The drainage in the northern area is quite poor. Swamps are everywhere and the floodplain of the Nashua River is wet during the whole year. Seasonal flooding is much more severe, with spring floods over two meters not uncommon.

Area J. CDS: 4.6 ZES: 21.0

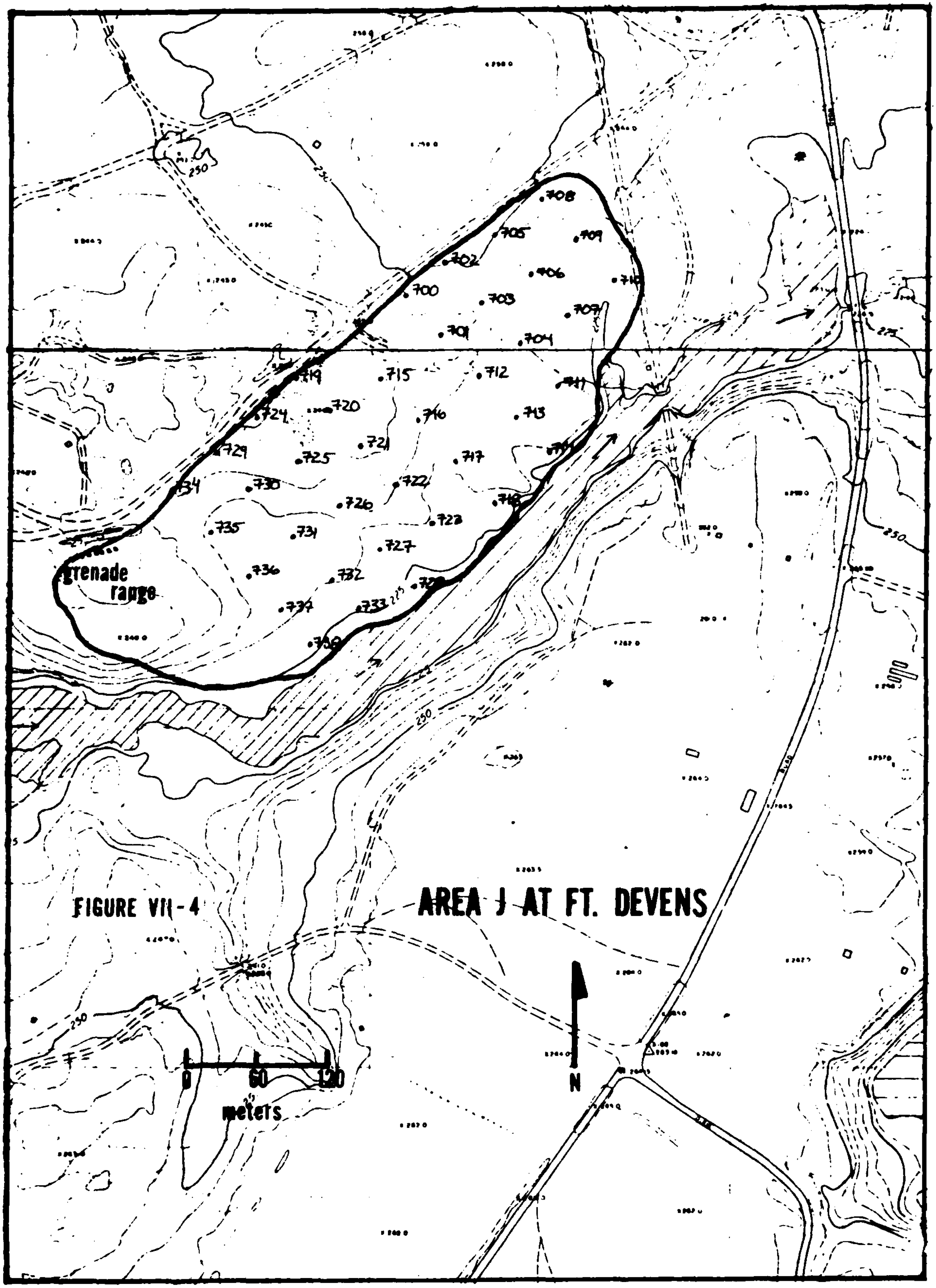
Area J is located on a sand bar overlooking swamps to the east, south and northwest. The swampy area along the southern edge has been dammed and is now Slate Rock Pond. Thirty-nine testpits were dug in the 72,000 square meter sample area. There is some localized disturbance in the form of dirt roads, camping (bivouac) areas and a hand grenade range. The vegetation is primarily hemlock and pine with smaller oaks and birches locally dispersed. The undergrowth is surprisingly sparse and may be the result of deliberate clearing. The composite soil profile is quite consistent. The silty layers under the humus indicate recently laid down river or flood sediments.

0 - 20 cm. - Humic layer, sandy dark brown.
20 - 60 cm. - Tan sandy silt.
60 - 100 cm. - Gray and tan sand, very uniform, some gravel.

Plate 32. Facility 1, Area J, Fort Devens, Mass. A typical view in area J.

Area K. CDS: 3.0 ZES: 24.0

Area K is a large flat sandy plain, some three meters above the swampy floodplain of the Nashua River to the southeast. It is located west of G range on the South Post. The drop to the river is quite abrupt and the floodplain of the Nashua is almost total swamp. Some better drained areas are located there but during the spring the whole floodplain is under water. It appears that the top of the bluff was scraped during the construction of rifle ranges and training areas. Sample testpits dug in the middle of the rifle range show no A or B zone soils. This area is periodically cleared to maintain visibility across the range. The area between Dixie Road and the eastern edge of the G range has also been levelled. Most of the testing was done between the eastern side of Dixie Road and the edge of the bluff to the river. Eighty two testpits were dug in area K, testing approximately 119,000 square meters of potentially undisturbed area. No cultural materials were discovered. The composite profile applies to the majority of testpits:



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733
738
250
FIGURE VII-4
AREA J AT FT. DEVENS
N
0
60
120
meters

0 - 20 cm. - Dark brown humic soil.
20 - 50 cm. - Tan sand occasional gravel.
50 - 100 cm. - Yellow, gray sand, some gravel.

Several interesting diversions from this norm are noted. In many testpits, 658, 659, 661, 663, 666 and 679, for example, the humus is quite deep, ranging from 40 to 70 cm. Testpits 637 and 639 both hit bedrock at 30 cm. The testpits at lower elevations tend to have thicker humic layers, thicker silt lenses of brown sand, and moister soil. The upper elevation testpits tend to have thinner humic zones, no brown silt and are almost totally glacial orange and yellow sands. The drainage on the top is very good.

The vegetation in area K fits the distribution for the whole South Range. Although there are no trees on top of the bluff in area K, surrounding areas support a coniferous forest. Down the slope, which is quite steep at times, the moister soil supports deciduous trees and swamp vegetation. The underbrush is much thicker down slope and the root systems made digging quite difficult at times.

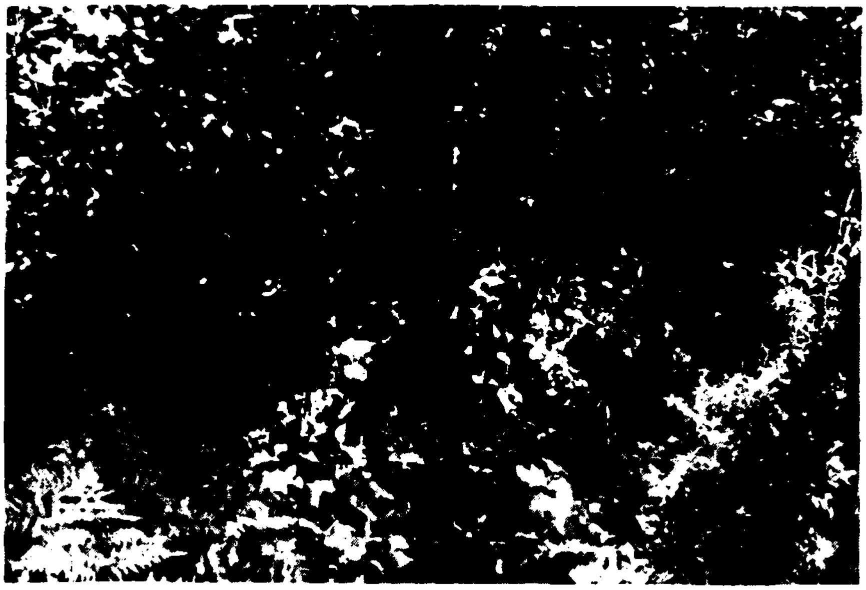


Plate 33. Facility 1, Area K, Fort Devens, Mass. Going down the slope in area K. Deciduous trees are replacing conifers and the underbrush is getting thicker.

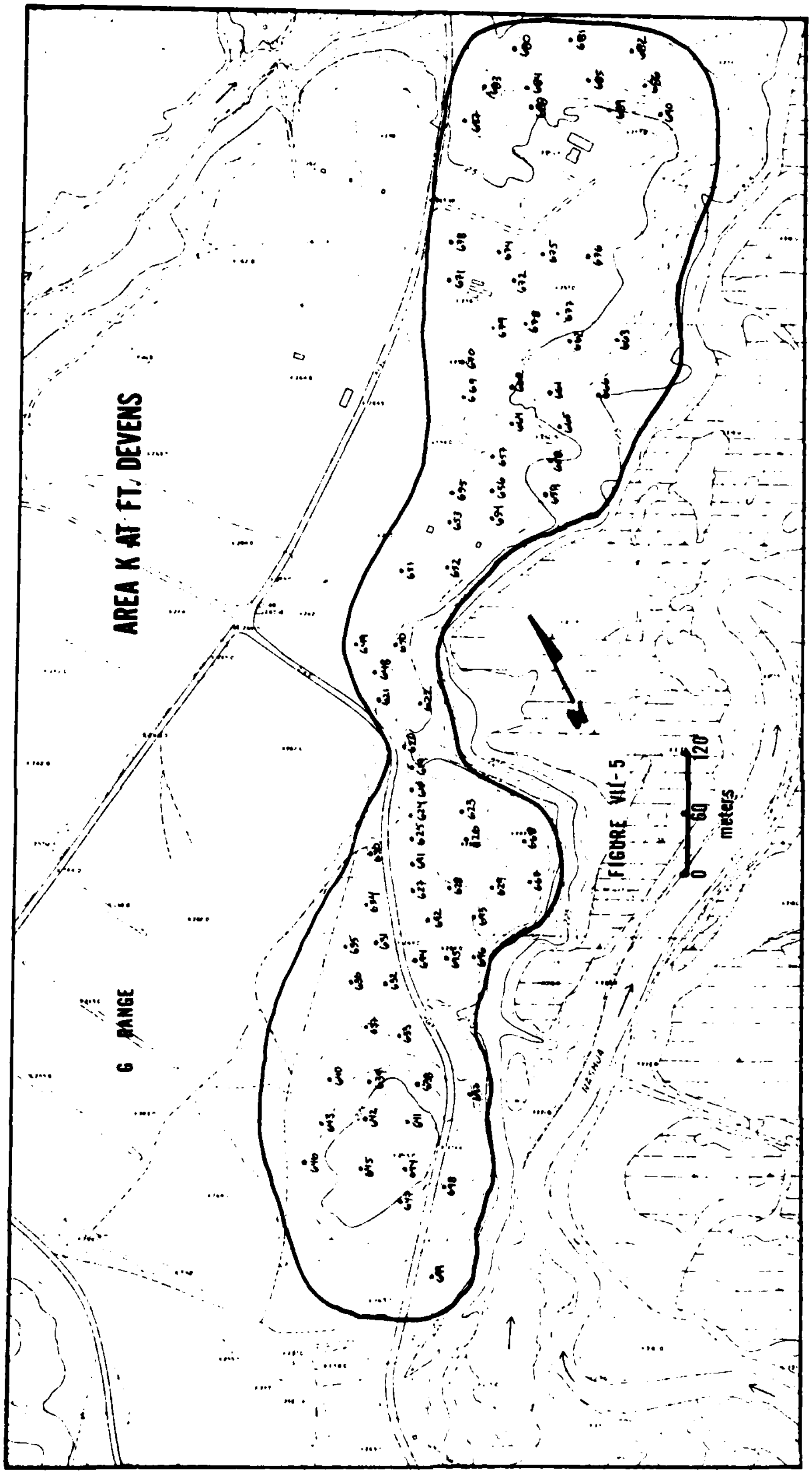
Plate 34. Facility 1, Area K, Fort Devens, Mass. On top of the bluff in area K. The G range is straight ahead. The impact area starts in the trees in the background.

Plate 35. Facility 1, Area K, Fort Devens, Mass. In the woods at the bottom of the slope in the swampy area. Note the water running toward the Nashua River, and the swamp vegetation.

Area L. CDS: Various ZES: 7.5

Area L is the largest test area on Fort Devens, totalling over 2.7 million sq. meters. Area L also represents the major testable portion of the South Range, and includes the three major untestable areas; the Turner Drop Zone, the impact area, and the many swamps. Smaller disturbed areas are the many small arms ranges, especially the group along the southeastern perimeter of the South Range, the tracked vehicle training area, the recoilless rifle and rocket ranges and mortar firing areas in the bivouac areas.

Area L was evaluated as a low sensitivity area and it was to be tested at the low sampling density method, that is 50% of the area was to be tested. The 50% sample was laid out in two transects, L1 and L2, running down from Whitmore Hill; L1 southeast into the low swampy area behind the rifle ranges, and L2 northwest across Shirley Road to the low



AREA K AT FT. DEVENS

FIGURE VII-5

ground and swamp situated there. These two transects, totalling 1.36 million sq. meters, cut across every topographic zone and every elevation, from the highest to the lowest. There were 311 testpits dug in areas L1 and L2. Although these two areas were a sufficient sample, another 1.36 million sq. meters were examined on a judgmental basis. The remainder, identified as areas L3 through L6, were tested as time permitted. Although no formal testing scheme was devised an attempt was made to test these sections as closely to the 50 meter grid as possible. There were 121 testpits dug in these sections. Instead of aiming for complete coverage, the Crew Chiefs and Field Director chose "likely" areas to be investigated first, with the idea of examining as much of the area as possible. Each of the L areas will be discussed individually below.

Area L1 contains 840,000 square meters and was tested with 192 testpits. No cultural materials were found. Two basic soil profiles were discovered. The upper elevations produced the following soil profile:

0 - 20 cm. - Dark gray humus.
20 - 50 cm. - Gray-brown sandy soil with some gravel.
50 - 100 cm. - Brown sandy soil with gravel.

The vegetation in the upper elevations is a mixed deciduous coniferous forest with oak, maple, birch, white pine and hemlock. In certain places almost pure stands of conifers dominate. The underbrush is moderately thin in the woods. Much of this area has been, and still is, kept cleared. The clearings contain typical regional grasses with brambles, sumac, golden rod, poison ivy and saplings of deciduous trees scattered about. This upper area is fairly well drained and the soils are slightly acidic. The glacial soil is probably derived from till, as is indicated by the unsorted gravel which is present throughout. On the lower sections the deciduous trees begin to dominate as the drainage deteriorates. Ferns dominate the underbrush, which gets quite dense even in the woods. Oaks, maples, ash, birch and alder are the most common. Here the humic layer is deeper but still B zone soil development is often retarded. In many instances the humic layer reaches down some 30 or 40 centimeters and rests directly on top of clays, although true clay strata are not common. This transition from sandy well drained soils supporting a conifer dominated mixed forest to wet soils supporting a deciduous forest is common in all the L areas. The soil profile for the lower section is given below:

0 - 30 cm. - Dark humus with large rocks.
30 - 60 cm. - Red yellow silt.
60 - 78 cm. - Gray clay; water at 78 cm.

This is the profile from testpit 1291, northwest of Shirley Road, and is typical of the lower elevation. The presence of silts in some lower pits suggests seasonal flooding of the swamps in that area. Localized disturbance include soil removal by tracked vehicles to level certain areas, ditch digging and large scale earthmoving.

Plate 36. Facility 1, Area L1, Fort Devens, Mass. View from Whitmore Hill down the slope. This marks the beginning of L1. Shirley Road is just beyond the six dead elms in the middle of the photo.

Plate 37. Facility 1, Area L1, Fort Devens, Mass. In the woods in the upper sections of area L1.

Plate 38. Facility 1, Area L1, Fort Devens, Mass. Test trench dug by mechanical trench digger. This is a typical cleared section in area L1.

Plate 39. Facility 1, Area L1, Fort Devens, Mass. Vegetation and topsoil removal by tracked vehicle.

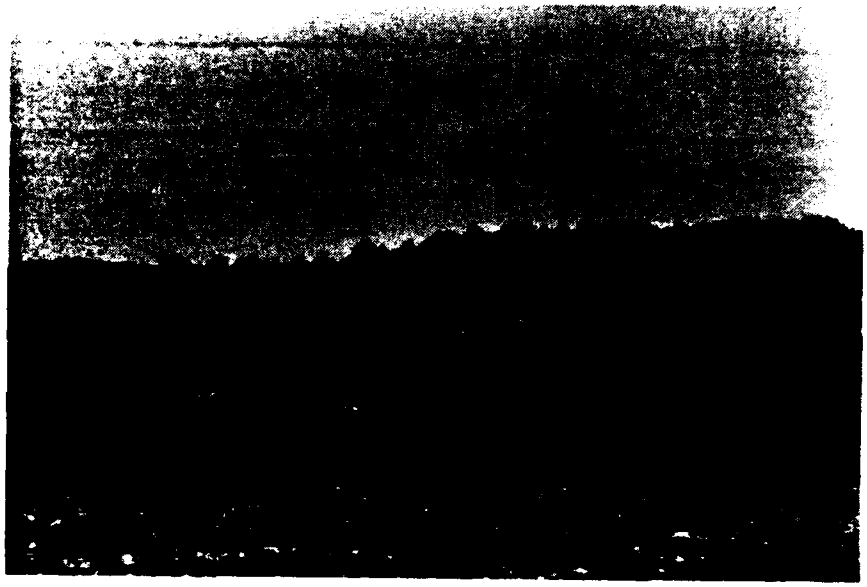


Plate 40. Facility 1, Area L1, Fort Devens, Mass. Major earthmoving in the foreground in area L1.

Plate 41. Facility 1, Area L1, Fort Devens, Mass. At the bottom of the slope on the edge of a swamp.

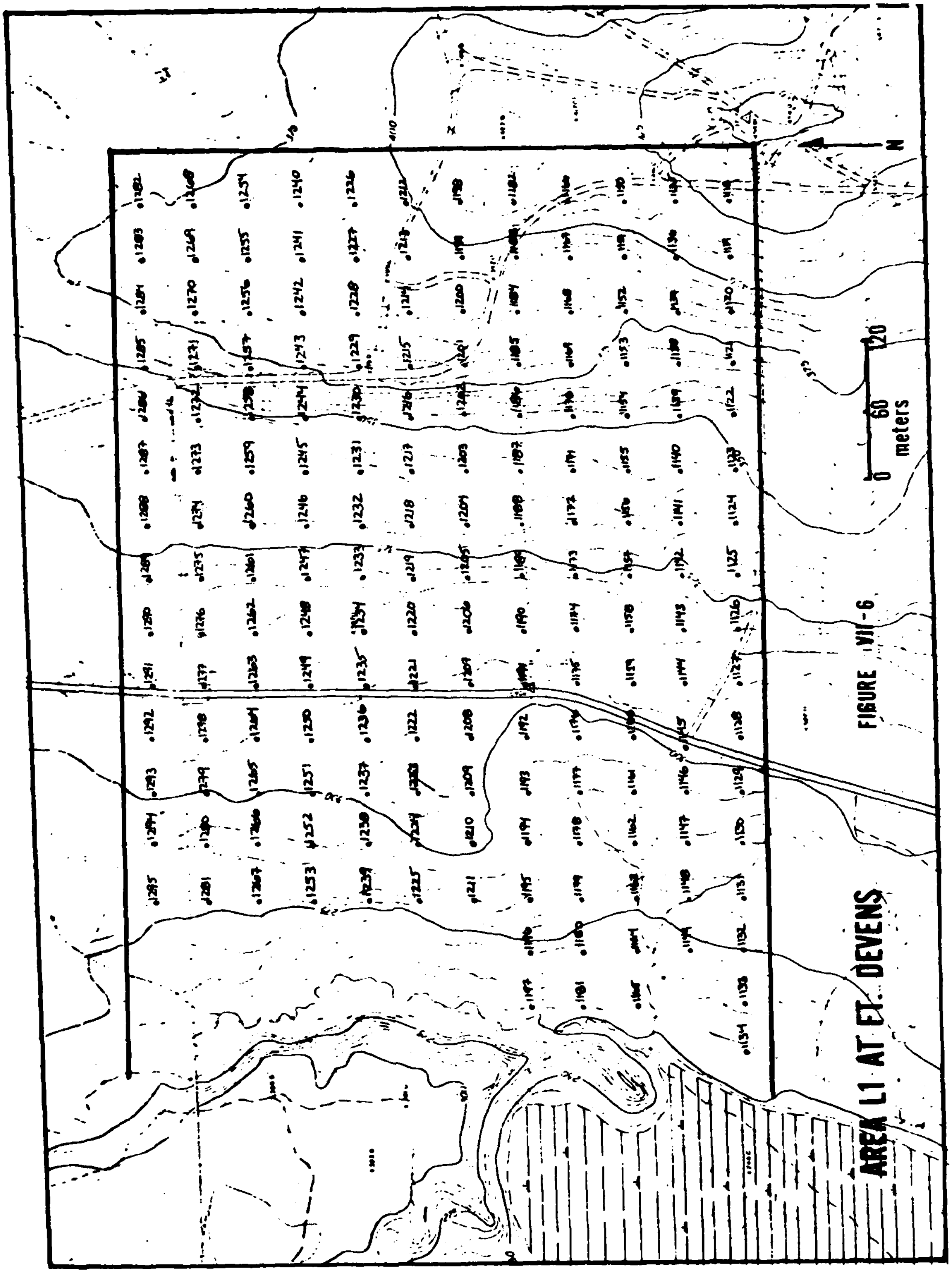


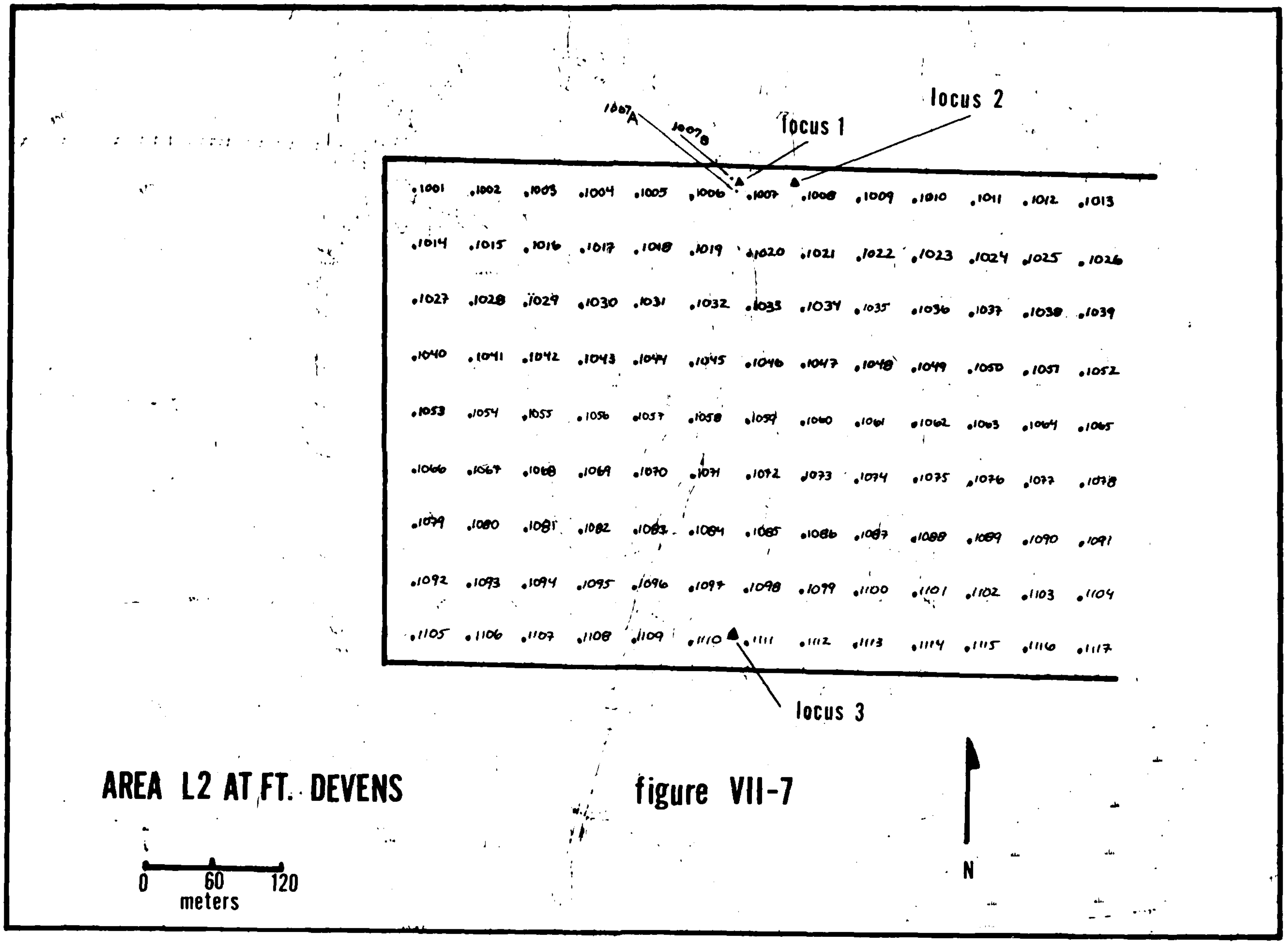
FIGURE VII-6

AREA L1 AT FT. DEVENS

Area L2 is 518,000 square meters in size and was tested with 119 testpits. No prehistoric materials were found. Remnants of two foundations and some other brickwork were uncovered. They will be discussed in detail below. The soils and vegetation of area L2 are essentially identical to those of area L1. L2 runs southeast down from Whitmore Hill to the swamp in back of the impact area.

Three areas of historic materials have been identified as loci 1 through 3, each to be described below. Locus 1 is a fieldstone and mortar foundation found in the vicinity of testpits 1007, 1007A, 1007B and 1008. Testpits 1007A and 1007B were placed to gather further information about the foundation. An outline of the foundation may be seen in Figure VI-8. Photos of the foundation are Plates 43 and 44. These areas did not photograph well because of the poor light conditions due to the dense undergrowth. The foundation is fieldstone but the walls of the structure were brick, several of which were found on the surface. The lack of wall and roof materials, yet the abundance of foundation materials suggests that the building was torn down and the rubble removed. The age of the foundation can only be guessed at since no diagnostic materials were found in the testpits. It is possible that the building could have been built as early as the 1830s. A map of the town of Shirley from 1830 shows several one story buildings scattered in what is now the South Range. We would assume that very early buildings would be made either from cut fieldstone or frame clapboard. The condition of the brick suggests a relatively late date for this structure. The foundation is situated on a fairly steep slope and there appears to be no large extent of arable land in the vicinity. Harvard Road, which is 50 meters to the east, runs along the eastern slope of Whitmore Hill and the western edge of the large swamp. This building overlooked both Harvard Road and the swamp.

Further investigation into this foundation produced no new information. An 1870 map of Shirley showed several isolated farmsteads in the vicinity of Fort Devens, but the scale of the map is so small, and the detail so poor, that the location of the foundation and the structures on the map could not be correlated.



AREA L2 AT FT. DEVENS

figure VII-7

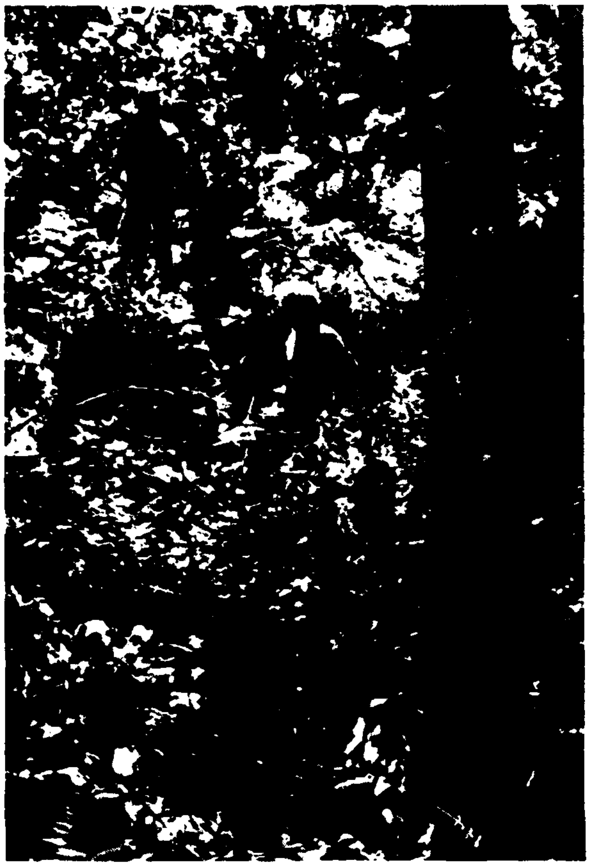
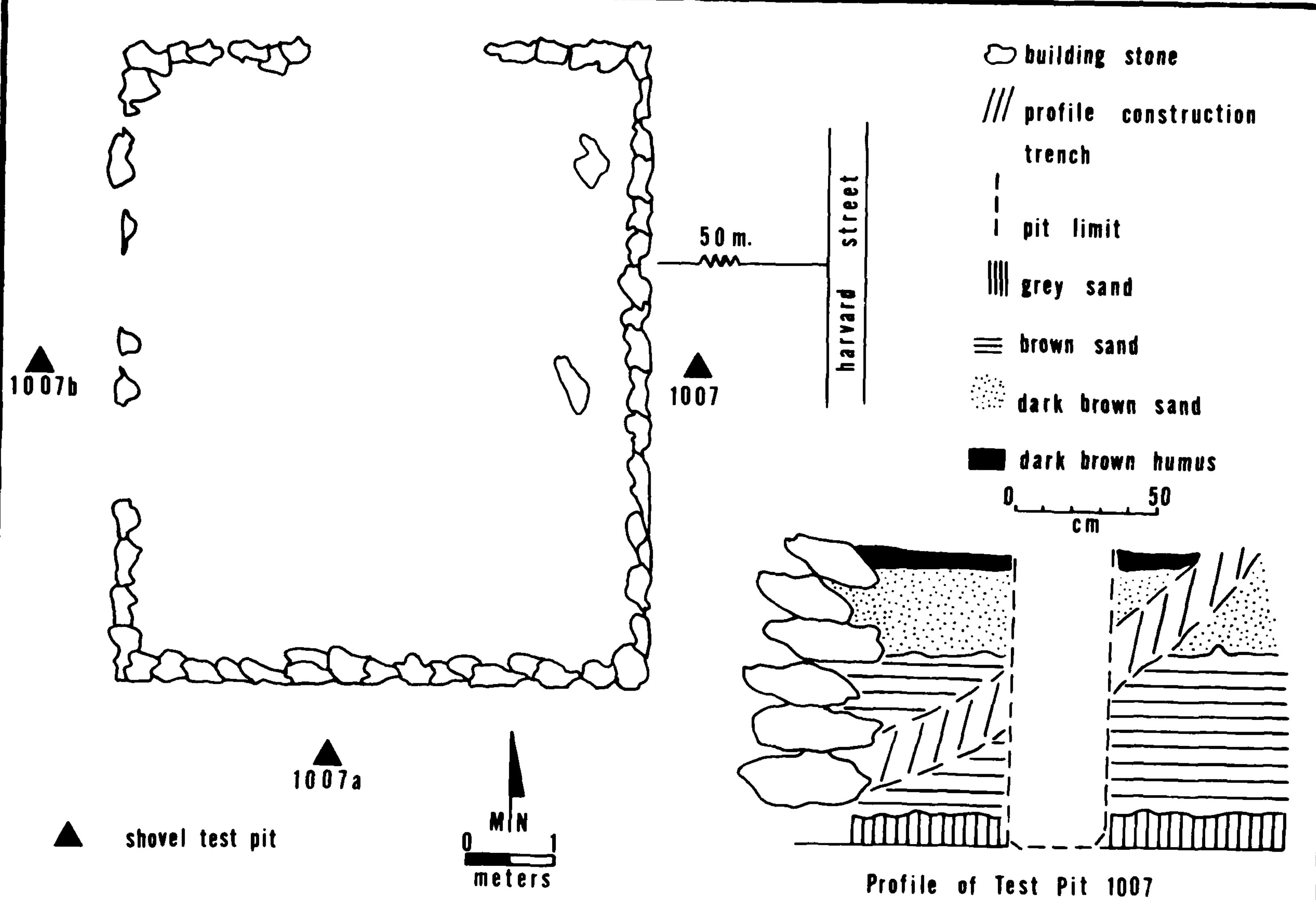


Plate 42. Facility 1, Locus 1, Area L2, Fort Devens, Mass. The person on the right is standing inside the foundation while the person to the left is standing outside of it. The north opening is between them.

Locus 2 appears to be a sluice gate. It consists of two concrete blocks, approximately two meters on a side and about one meter high. They are separated by a 60 cm. gap which at one time held a sluice gate, parts of which are still in place. To the left, uphill side, of the sluice gate is a wet area which apparently contained the water which washeld back by the sluice. The function of this structure is unknown. There are no streams in the area that would operate a mill, nor were there any structures associated with the sluice gate. The sluice gate is located 35 meters east of Harvard Road, and 85 meters from Locus 1, the foundation described above. Although it is possible that the two structures were associated, it would seem unlikely, especially since Harvard Road runs between them. Plates 44 and 45 show the sluice gate.

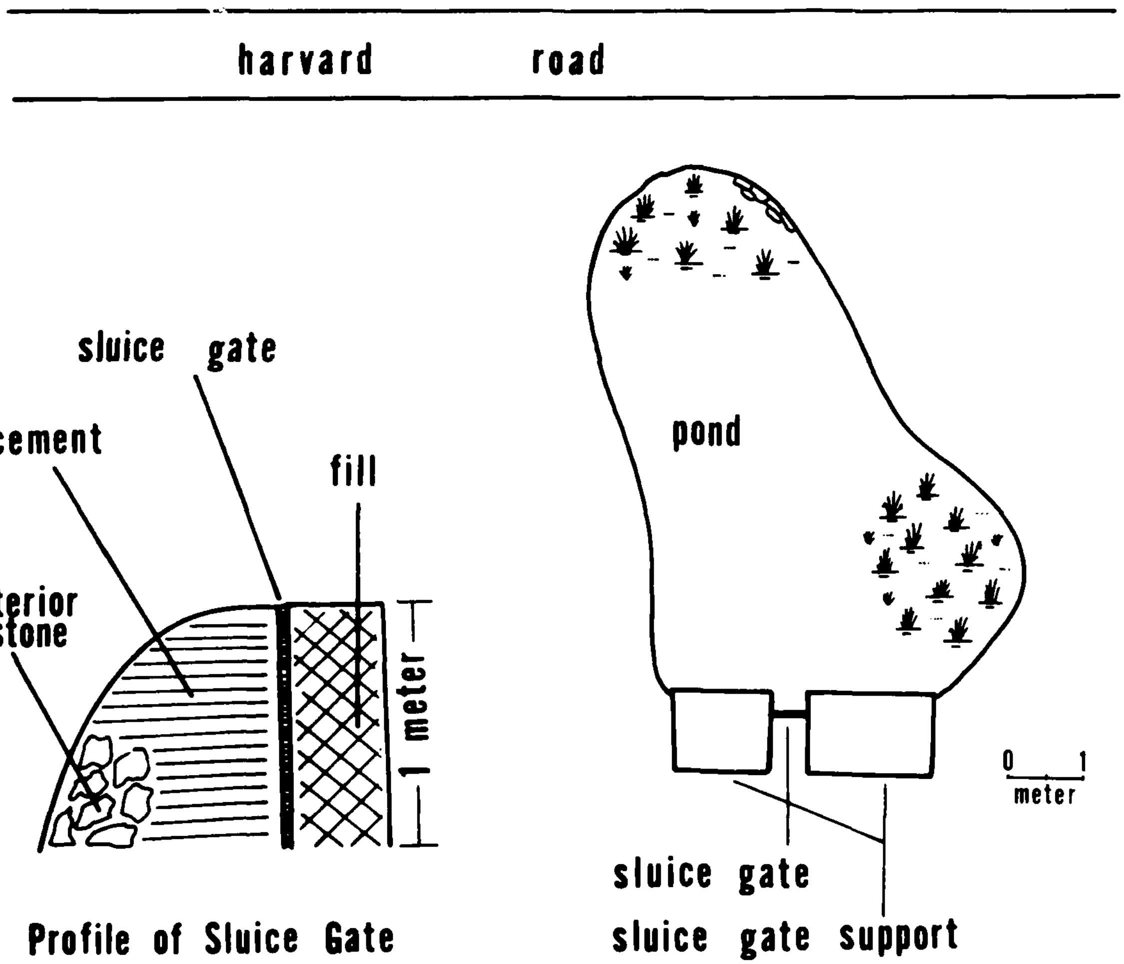


map by a.krievs

FIG. VII-8 FOUNDATION IN LOCUS 1

n. testi

Plate 43. Facility 1, Locus 1, Area L2, Fort Devens, Mass. Inside the foundation.



Profile of Sluice Gate

Locus 2 in Area L2 at Ft. Devens

june 1979 FIG. VII-9 n. testi

Plate 44. Facility 1, Locus 2, Area L2, Fort Devens, Mass. Looking east, across the wet area, at the sluice gate remains.

Plate 45. Facility 1, Locus 2, Area L2, Fort Devens, Mass. The sluice gate at Locus 2 in area L2. Part of the wooden sluice gate is still in position between the concrete supports.

The presence of concrete and the well preserved condition of the wood suggest that the sluice gate is not earlier than 1870. It's purpose is more elusive. It may have been decorative, such as a pool or Japanese garden, but that seems unlikely given the settlement pattern of this area during the nineteenth century. The wet area created by the sluice was apparently lined with stones. The depth and size of the wet area seems to be insufficient for water power or even water storage.

Locus 3 may be part of a foundation in the vicinity of testpit 1110. Between 25 to 50 centimeters below the surface three large stones connected with mortar were found in the testpit. The surface was scattered with bricks and what appears to be modern window glass. There were no diagnostic artifacts recovered here either. The building that stood here seems to be of the same construction as that found in Locus 1, that is, a mortared fieldstone foundation with brick walls. Plate 46 shows the profile of testpit 1110 and the foundation that was found there.

Plate 46. Facility 1, Locus 3, Area L2, Fort Devens, Mass. The foundation segment found in testpit 1110.

The only other historic materials recovered are several glass, brick and undiagnostic ceramic fragments found at a depth surface to forty centimeters in testpit 1060. No other indications of structures of other materials were found in the area. There appear to be less localized disturbance in area L2 than in L1, and there are less cleared zones also.

Plate 47. Facility 1, Area L2, Fort Devens, Mass. At the top of Whitmore Hill, looking south east towards area L2.

Plate 48. Facility 1, Area L2, Fort Devens, Mass. In the woods down the slope in L2.

Plate 49. Facility 1, Area L2, Fort Devens, Mass. In the woods near the top of area L2. Note the lack of underbrush in this stand of hemlock.

Area L3 encompasses 300,000 sq. meters although much of the terrain in that area is untestable due to an extensive swamp and much localized disturbance, including a tracked vehicle training area. Twenty-seven testpits were dug here; no cultural materials were found. This area is a flat sandy plateau overlooking a swamp and the floodplain of the Nashua River some 23 meters below. The actual floodplain of the river, as is the river itself, is outside the facility boundary. The composite soil profile is quite consistent except that pits down the southeastern slope hit water as they neared the swampy areas there. The soil appears glacial. The higher elevations are well drained, supporting a mixed coniferous-deciduous forest, with a light undergrowth. Several testpits also hit bedrock between 40 and 50 cms.

0 - 20 cm. - Brown humic sand.
20 - 50 cm. - Red-orange sand with gravel and cobbles.
50 - 100 cm. - Tan sand with cobbles, some pits hit clay.

Plate 50. Facility 1, Area L3, Fort Devens, Mass. Looking southwest down Bivouac Road into area L3.

AREA L3 AT FT. DEVENS

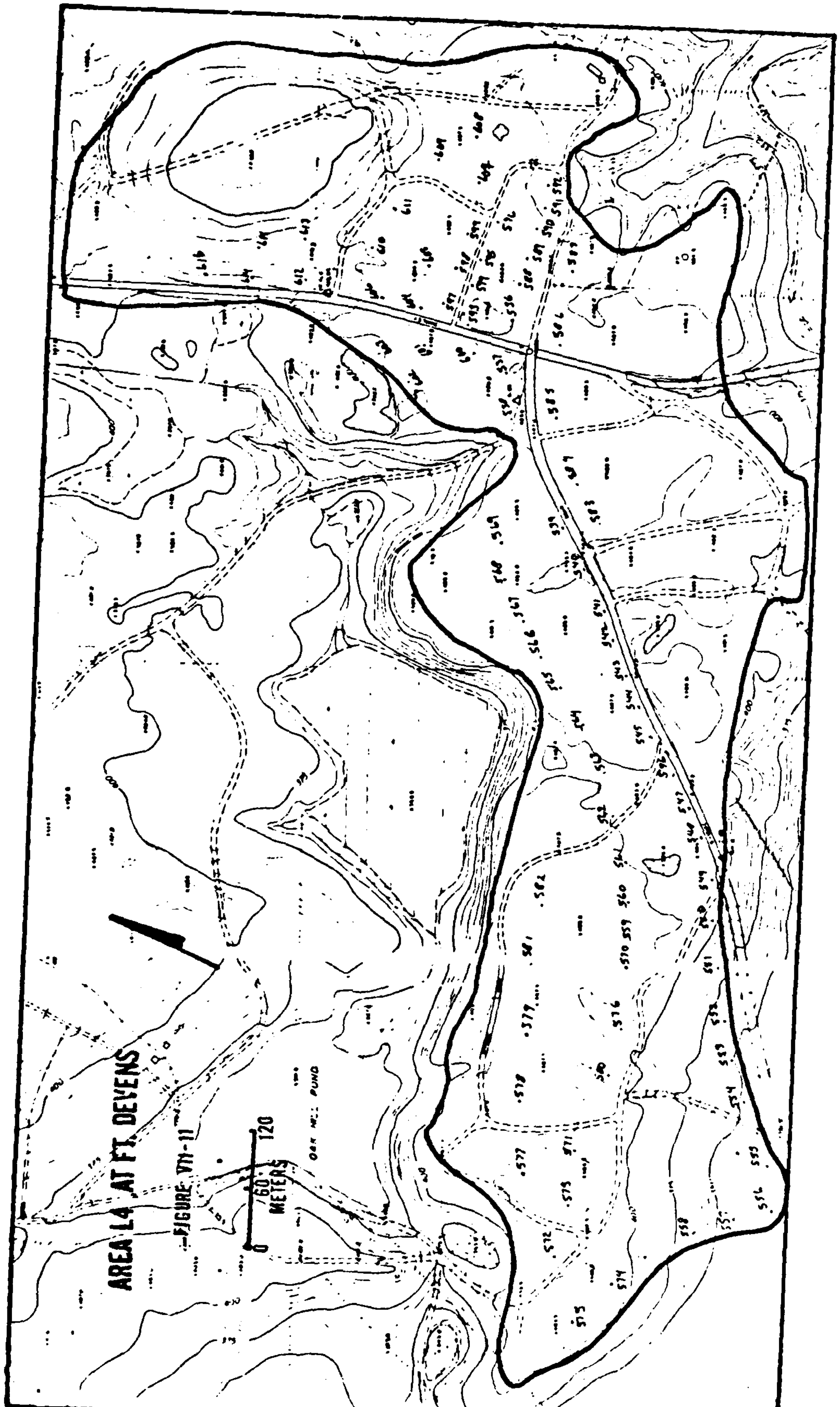
FIGURE VII-10

Area L4 is a relatively flat sandy area surrounded by a large number of small swampy zones. The 910,000 square meters were tested with 81 testpits. No cultural materials were found. The soils and vegetation are similar to most of the rest of the South Range, that is yellow and tan glacial sands with gravel supporting a mixed coniferous-deciduous forest. Localized wet areas support a deciduous forest with thick undergrowth and ferns. Cleared areas are thickly overgrown with briars, sumac, shrub oak and birch.

Area L5 is a similar area located to the northwest. Approximately 110,000 square meters were tested with nine widely scattered testpits. No cultural materials were found. Soil and vegetation conditions are identical to L4.

Area L6 is a small piece of property in the western corner of the South Range. The 38,000 square meters had four testpits scattered about to verify the stratigraphy. No cultural materials were found. The soils and vegetation are similar to areas L3, L4, and L5.

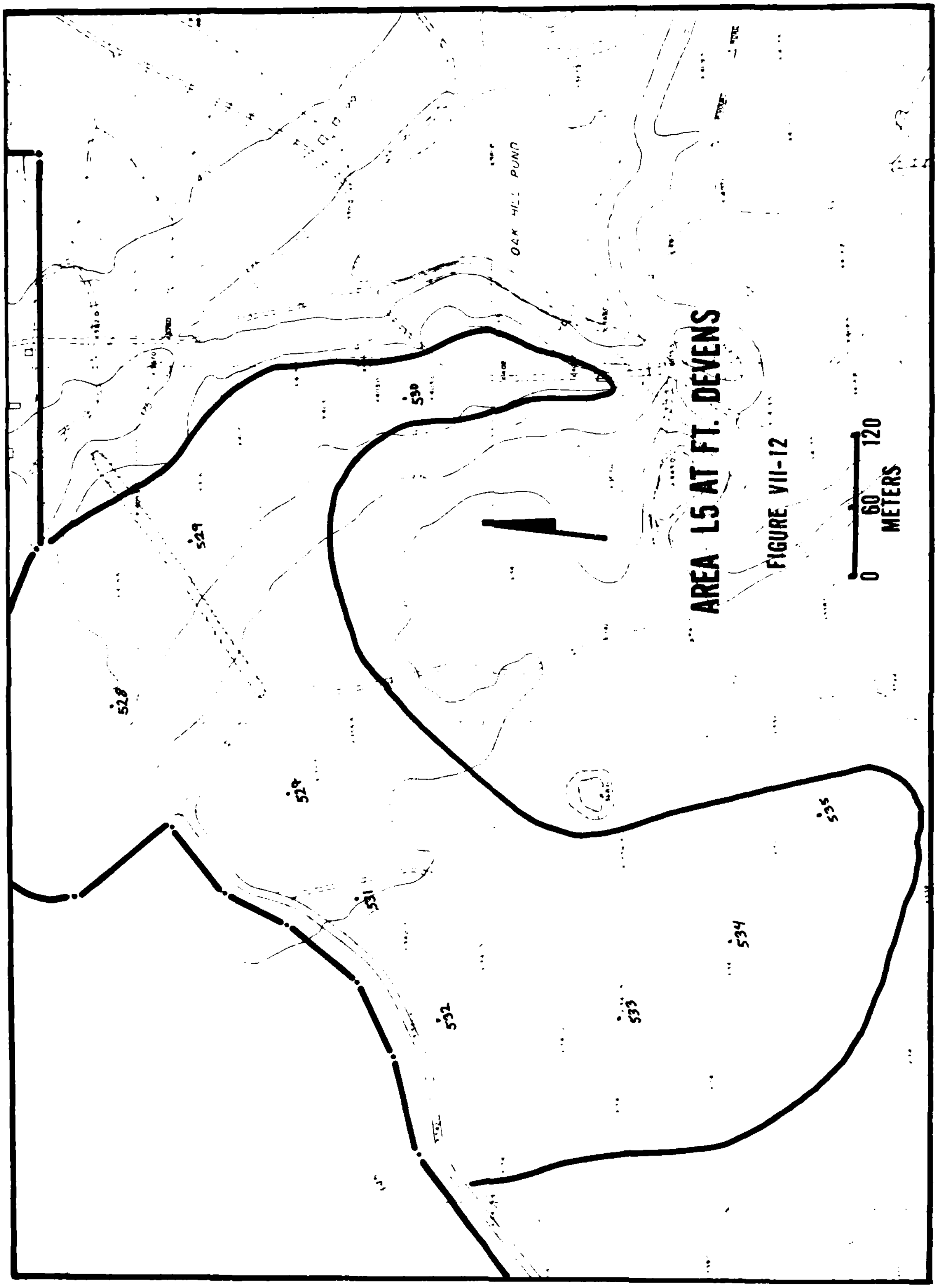
Plate 51. Facility 1, Area L4, Fort Devens, Mass. Looking into the woods in area L4. Notice the light sand on the surface.



AREA L4 AT FT. DEVENS

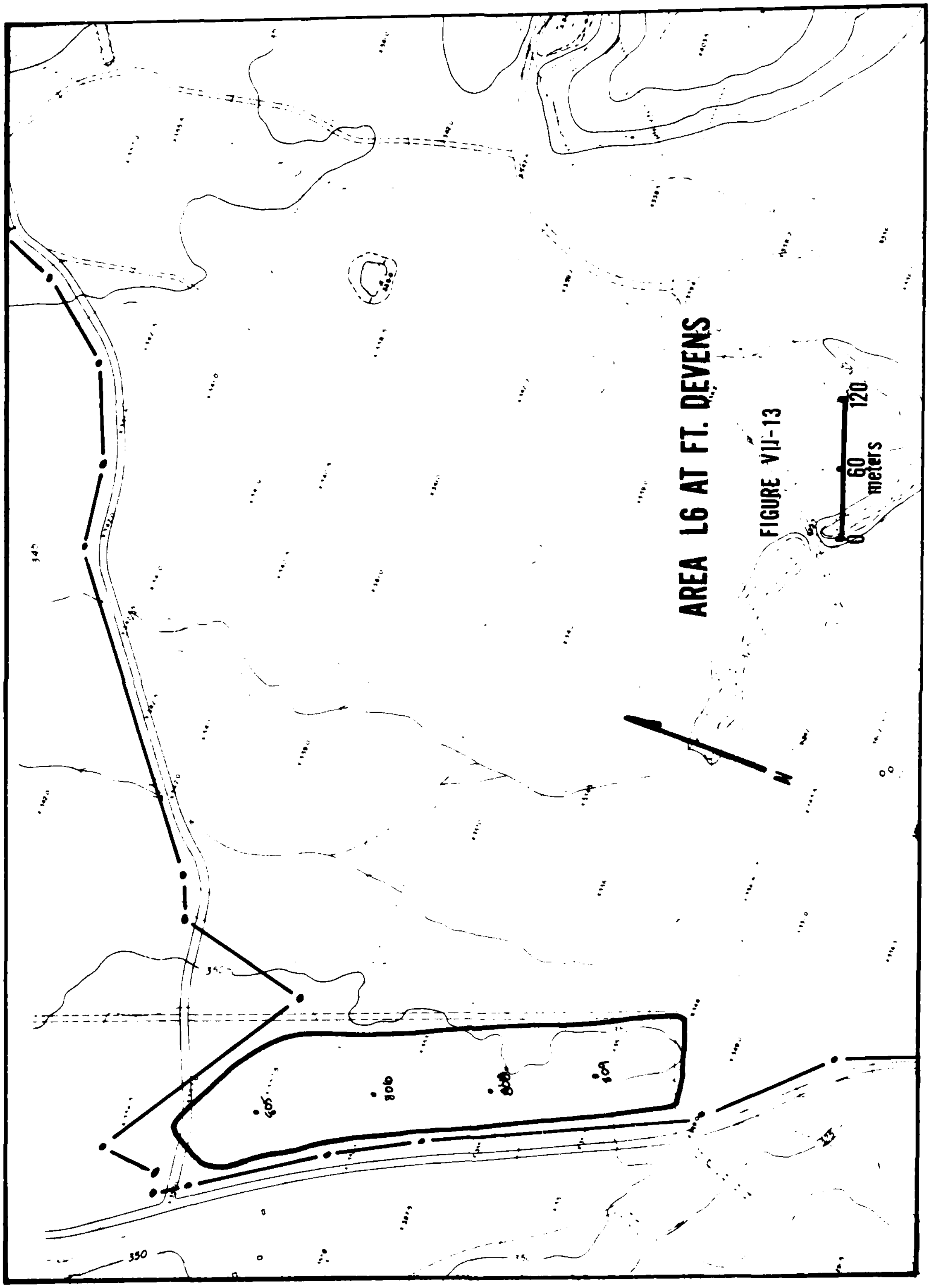
FIGURE VII-11

Plate 52. Facility 1, Area L5, Fort Devens, Mass. A cleared area.



AREA L5 AT FT. DEVENS

FIGURE VII-12



AREA L6 AT FT. DEVENS

FIGURE VII-13

Facility Name: South Boston Support Activity.
Facility Number: 2
Level of Investigation: Stage I
CDS: 6 ZES: 9.5
Disturbance Type: 3
Cultural Resources Sensitivity: Low
Contact: Mr. F. J. Melanson (617) 542-6000 x106
Mr. M. Coviello (617) 542-6000 x108

The facility consists of two sections. The first section is a warehouse-manufacturing building of early twentieth century origin. This structure is located at 435 Summer Street in Boston and is currently being renovated to accommodate offices. The property includes a nine story building and a paved parking lot which are located an industrial neighborhood in the vicinity of Boston Harbor.

The second section of this facility is the South Boston Support Facility located at 666 Summer Street. This was a supply base for the United States Army and dates from 1917. It now houses various Department of Defense activities. The building was constructed on fill in the Boston Harbor. No vegetation exists on either part of the facility nor are there any surface soils exposed.

There seemed to be no reason for any additional work under Stage II at the South Boston facility. There are no reported cultural resources on or near the facility. The history of this facility has been adequately documented in Fay, Spofford, and Thorndike (1919).

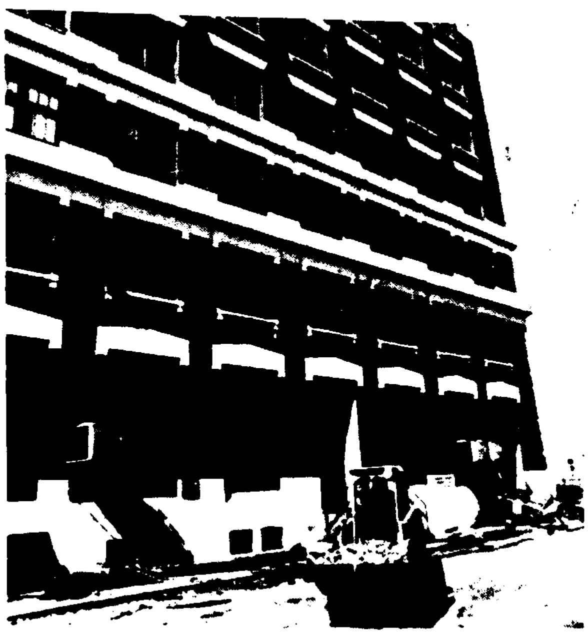


Plate 53. Facility 2, 435 Summer St., Boston, Mass. The office building at 435 Summer Street.

Plate 54. Facility 2, 435 Summer St., Boston Mass. The parking lot east of 435 Summer Street.

Plate 55. Facility 2, 666 Summer St., Boston, Mass. The marine supply terminal at 666 Summer Street.

Facility Name: Burlington
Facility Number: 3
Level of Investigation: Stage I
CDS: 12.0 ZES: 9.5
Disturbance Type: 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

The facility is a 12 unit family housing area which was constructed in the 1950s. The structures are located on Bedford Road, Burlington, Massachusetts. The facility is situated on acidic soils approximately nine meters above poorly drained areas to the south and west. There are no reported sites located within a 1.6 kilometers radius of the facility. Two prehistoric sites, 3-276 and 3-255, are located approximately 3 kilometers to the east and southeast. The facility has been totally disturbed and there is no reason for additional work.

Plate 56. Facility 3, Family Housing, Burlington, Mass.

Facility Name: Nahant
Facility Number: 4
Level of Investigation: Stage I
CDS: 13.4 ZES: 13.5
Disturbance Type: 1, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

The facility is a 1950s family housing area located on Goddard Road, Nahant, Massachusetts. There are no known sites within a 1.6 kilometers of the facility. The facility is highly disturbed. The soils are sandy and rocky and the facility sits slightly elevated, facing a salt marsh northwest of Nahant Harbor. Due to the amount of disturbance, no further investigation is required.

Plate 57. Facility 4, Family Housing, Nahant, Mass. The cleared area at the lower left is not part of the facility. The salt marsh is to the rear.

Facility Name: Wakefield
Facility Number: 5
Level of Investigation: Stage I
CDS: 6.0 ZES: 10.5
Disturbance Type: 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This is a 13 unit 1950s family housing area located on Tarrant Lane, Wakefield, Massachusetts. There are no known prehistoric sites near the facility. The John Welton House (FD-1), which was constructed in 1735, lies 400 meters west of the facility. This facility is situated on glaciated terrain on slightly acidic soils overlooking large poorly drained areas to the north and east. The facility appears to be totally disturbed and no further investigation is required.

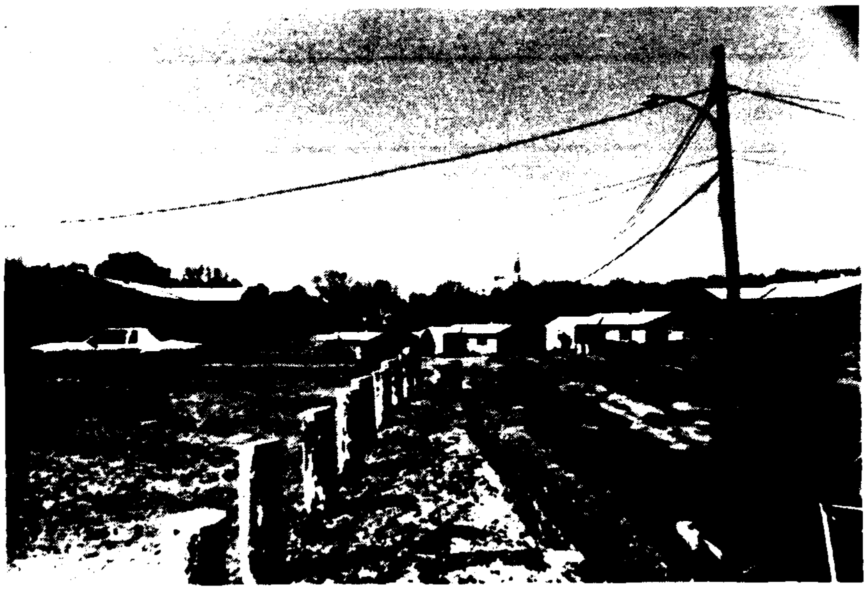


Plate 58. Facility 5, Family Housing, Wakefield, Mass.

Facility Name: Danvers
Facility Number: 6
Level of Investigation: Stage II
CDS: 18.4 ZES: 14.0
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. Morriaty (617) 774-3158

This facility is an old Nike control site which was converted into a reserve center in the early 1960s. The facility is located at 72 North Street, Danvers, Massachusetts, on top of a 30 meter high hill in a glaciated upland area.

There are approximately 4500 square meters of undisturbed gently sloping meadow which are located in the southwest corner of the facility compound. The prehistoric sensitivity of this facility is low and was tested by the low sampling density method. There is some local construction which appears to be concrete footings for radar or radio towers. The disturbance from these footings seems to be very localized. The test area was examined with six testpits. No cultural materials were discovered. The composite soil profile is very uniform.

0 - 30 cm. - Dark brown sandy humic zone and sod.
30 - 70 cm. - Brown sand with some clay and gravel.
70 - 100 cm. - Very compact gray and tan clay with some sand and bedrock crush.

There was more localized disturbance here than was previously thought. The test area was the site of the tracking radar towers, although only the concrete footings and the cable trenches remain. The vegetation on the facility is grass, with a few cedars, while on the outside it is a mixed conifer-deciduous forest of pine, hemlock, oak and maple. It appeared as if the soil was locally developed from the bedrock. The soil is thin, most of it being scraped away during glaciation. The dark and extensive humic zone is probably caused by the grass which was planted here. The soils in the woods have less humic content. Drainage here appears to be good despite the clay content of the C zone soils. The slope and elevation probably account for this fact.

Plate 59. Facility 6, Reserve Center, Danvers, Mass. Looking from the test area towards the reserve center. A tower footing can be seen at the very edge of the photo. Even the unpaved areas in the middle foreground have been levelled.

Plate 60. Facility 6, Reserve Center, Danvers, Mass. The test area.

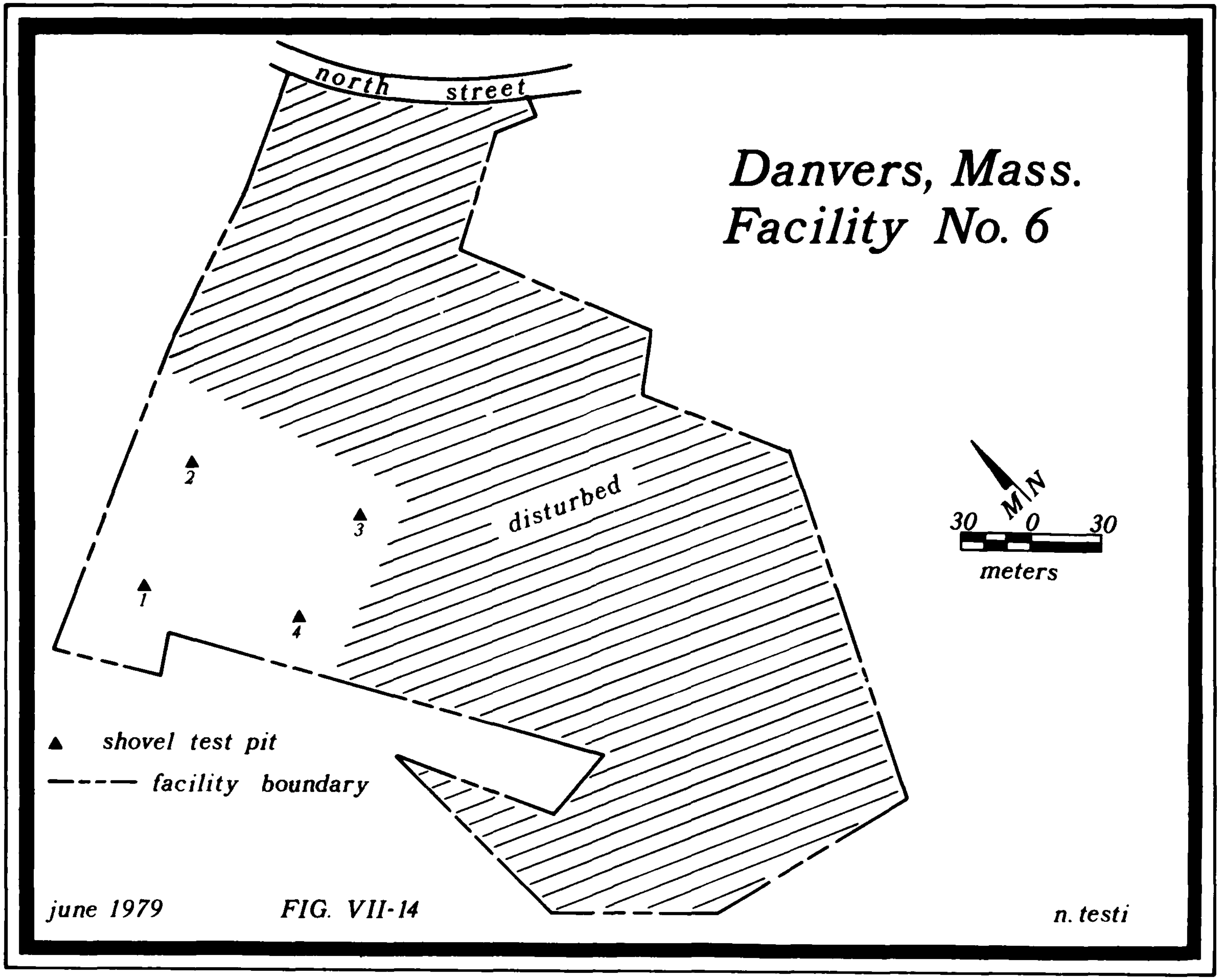

Danvers, Mass.
Facility No. 6
north street
disturbed
1
2
3
4
M
N
30
0
30
meters
shovel test pit
facility boundary
june 1979
n. testi

FIG. VII-14

Facility Name: Beverly
Facility Number: 7
Level of Investigation: Stage I
CDS: 10.4 ZES: 8.0
Disturbance Type: 1, 3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area on Laurel Street, North Beverly, Massachusetts. Historic site FD-2, the Orgeni Dwelling, constructed in 1855, is located 1.6 kilometers west of the facility. There are no prehistoric sites near the facility. The Beverly facility is totally disturbed and no further investigation was required.

Plate 61. Facility 7, Family Housing, Beverly, Mass.

Facility Name: Hull
Facility Number: 8
Level of Investigation: Stage I
CDS: 4.4 ZES: 13.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

All that is remaining of the Hull facility is an eight unit family housing area which is located along Nantasket Avenue, Hull, Massachusetts. At one time the military facility at Hull was much larger and included Fort Duvall. Ten historic sites, FD-3 through FD-12, are located south and west of the housing area. Site FD-12, Fort Independence, is listed on the National Register of Historic Places. Prehistoric shell middens 8-266 and 8-265 are located 1.6 kilometers to the east of the facility. The facility overlooks a tidal flat in Massachusetts Bay. Despite the close proximity of these sites to the facility, it was decided that additional work was not necessary due to the disturbance of the Hull facility.

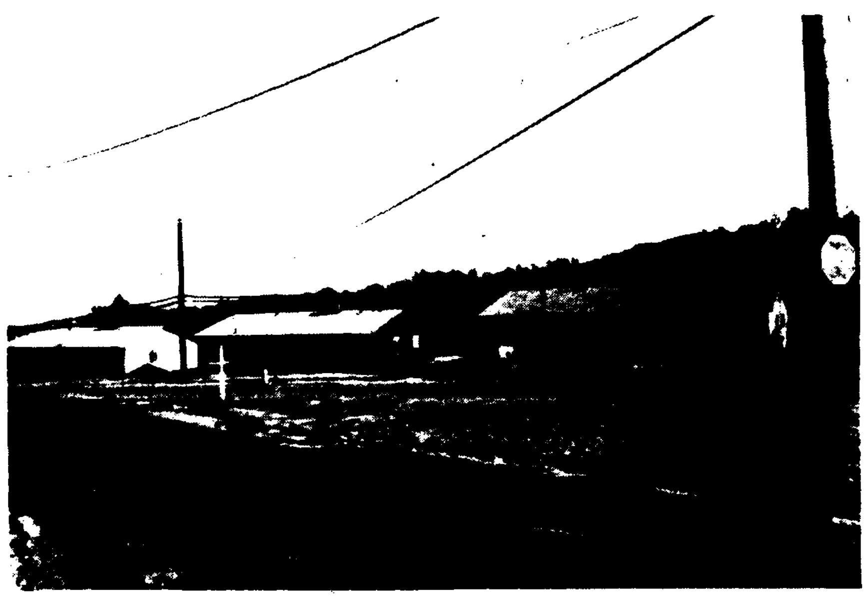


Plate 62. Facility 8, Housing Area, Hull, Mass.

Facility Name: Quincy
Facility Number: 9
Level of Investigation: Stage I
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. J. Koch (617) 773-1380 x267

The literature and document search located no known sites, either prehistoric or historic, within the present limits of the facility. Several historically sensitive buildings were, or are, located within a 1.6 kilometer radius of the facility.

The history of the facility itself is not well known. It appears that this property was farmland until recent times, most likely the early twentieth century. The property was obtained by the United States Army in 1952 and Nike Battery 40 was constructed on the property. The launcher site to the east has been returned to local ownership. The portion of the facility which remains under United States Government control is the old living quarters compound, which already houses a number of local county and town offices. The entire facility has been either built on or paved. It also appears that the facility has been built up and leveled by bringing in fill. The level and clear area in the lower left of the facility map (west) is the area of a leachfield. The facility has been totally disturbed and there appeared no justification for further testing.

Plate 63. Facility 9, Quincy, Mass.

Facility Name: Randolph
Facility Number: 10
Level of Investigation: Stage I
CDS: 2.8 ZES: 18.5
Disturbance Type: 0, 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area located in an urban section of Randolph, Massachusetts, on Army Street. Prehistoric site 10-115 is located about 800 meters northeast of the facility across a swamp. The housing area is situated on a landscaped slope overlooking a swamp and intermittent stream. The hydrology of the whole area has been greatly changed by the creation of the artificial Great Pond and Upper Reservoir. No further investigation was required at the Randolph facility due to the amount of disturbance present.

Plate 64. Facility 10, Family Housing, Randolph, Mass.

Facility Name: Bedford
Facility Number: 11
Level of Investigation: Stage II
CDS: 4.0 ZES: 16.0
Disturbance Type: 0, 1, 2
Cultural Resources Sensitivity: High
Contact: Mrs. Pelletiez (617) 275-2470

This facility is a 15 unit family housing area located on Mickelson Lane, Bedford, Massachusetts. A variety of historic sites, FD-14, FD-15, and FD-16 are located within a 1.6 kilometer radius of the facility. There are no prehistoric sites located on or adjacent to the facility. The playground area associated with the family housing appeared undisturbed during Stage I and overlooks a small creek. It seems a good location for prehistoric remains, making the prehistoric sensitivity of this facility high. The test area, 1000 square meters, overlooks a seasonal creek and swamp. It was tested with four testpits and the only material recovered was some plastic and brick. The composite soil profile suggests that the area might have been reinforced with fill to keep it from eroding into the creek. The vegetation in the area consists of hemlock, pine, maple, ash, oak and shrubby undergrowth.

0 - 30 cm. - Dark brown humic sand.
30 - 100 cm. - Brown sandy loam with lots of cobbles and some clay.

Based on the results of the Stage I and II investigation no further work was recommended.

Plate 65. Facility 11, Family Housing, Bedford, Mass. The playground at the Bedford Housing area. The drop to the creek bed is in the woods at the rear.

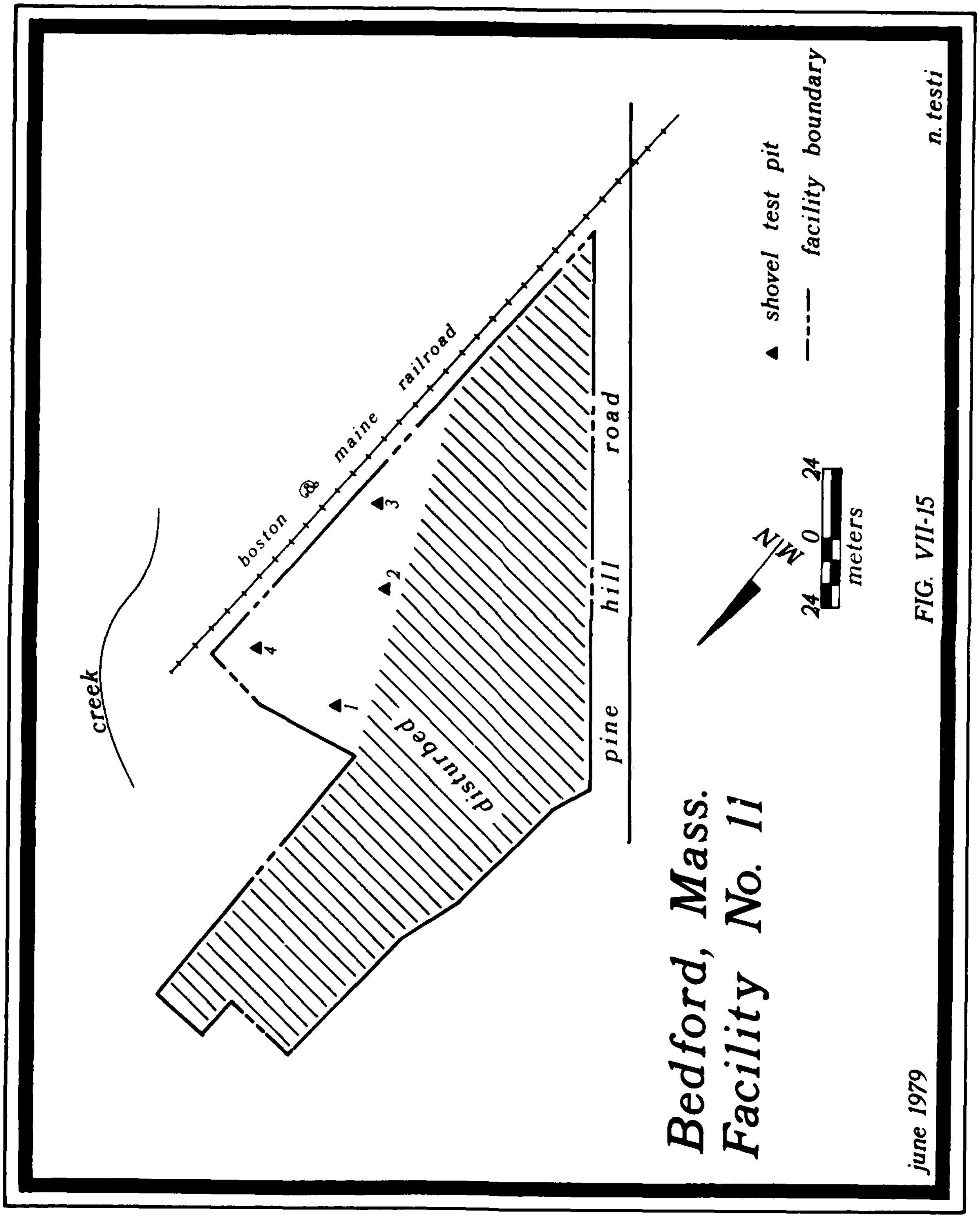

Bedford, Mass.
Facility No. 11
creek
boston & maine railroad
disturbed
pine hill road
1
2
3
4
MN
24 0 24
meters
▲ shovel test pit
facility boundary
june 1979
n. testi

FIG. VII-15

Facility Name: Taunton
Facility Number: 12
Level of Investigation: Stage II
CDS: 12.8 ZES: 21.0
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: High
Contact: John Martin (617) 823-0764

This facility is an Army Reserve Center located at 130 Eldridge Street, Taunton, Massachusetts. Although no sites are known to exist on or near the facility, this general area is considered to be highly sensitive.

Approximately 8600 square meters of possibly undisturbed woods are located at the rear (southwest) of the facility. A stream which at one time ran through the middle of the facility has been buried in a culvert. This undisturbed area is somewhat swampy. Part of the facility is situated on slightly elevated ground in an area of swamps and poor drainage. Other parts have been filled to improve drainage.

Approximately 8600 meters of area were tested with 12 testpits. No evidence of cultural materials was recovered. The composite soil profile is shown below:

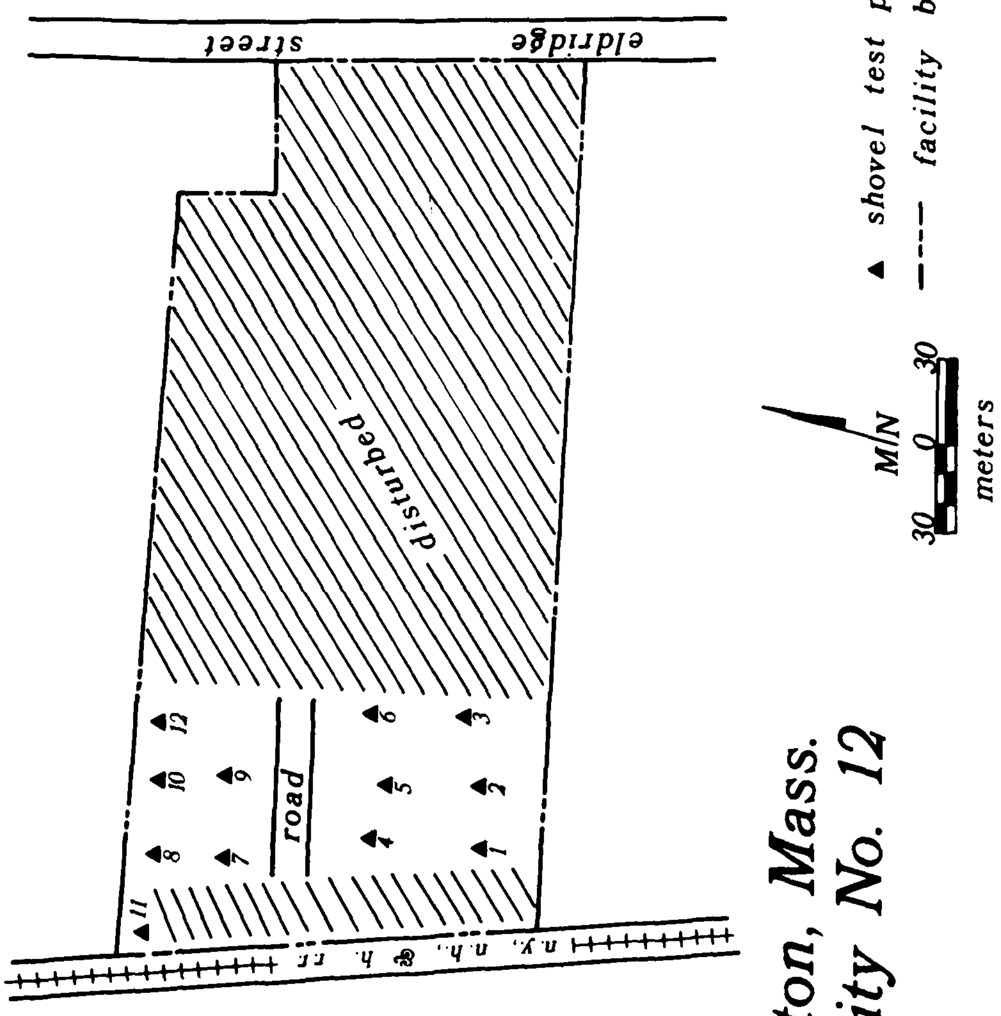
0 - 20 cm. - Dark brown humus with much organic material, fairly moist.
20 - 40 cm. - Brown sandy soil with some glacial gravel.
50 - 80 cm. - Gray tan sand, probably glacial.
80 - 100 cm. - Gray sand, some areas have glacial gravel lenses or blue clays. Water in several testpits between 80 to 100 cm.

The dominant vegetation in these areas is a mixture of pine, maple, ash and ferns. Drainage in the area is not very good and a swamp is located nearby outside the facility. The drainage must have been even poorer before the stream which ran through the facility was buried in the culvert.

Plate 66. Facility 12, Reserve Center, Taunton, Mass. In the foreground is the stream buried in a culvert, photograph taken from the undisturbed area looking northeast.

Plate 67. Facility 12, Reserve Center, Taunton, Mass. The undisturbed area being tested. Note the ferns which indicate poor drainage.

Plate 68. Facility 12, Reserve Center, Taunton, Mass. A disturbed section in the wooded test area. This section was cleared, scraped and filled for an access road.



Taunton, Mass.
Facility No. 12

june 1979

n. testi

FIG. VII-16

Facility Name: Cranston
Facility Number: 13
Level of Investigation: Stage I
CDS: 9.0 ZES: 8.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a reserve center located on Rockcrest Street, Cranston, Rhode Island. It is situated on Slate Hill, some distance from water Prehistoric site 13-12 is located 1.6 kilometers south of the facility.

The facility appears to be totally disturbed, including landscaping and complete paving of level areas. No further work was required at the Cranston facility.

Plate 69. Facility 13, Reserve Center, Cranston, R.I.

Facility Name: Swansea
Facility Number: 14
Level of Investigation: Stage I
CDS: 7.4 ZES: 16.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area on Missle Loop, Swansea, Massachusetts.

The facility is located on acidic soils on high and dry ground overlooking a swamp, which traditionally has been a favorable location for prehistoric groups to camp. However, this area has been totally disturbed and it is quite possible that the high ground is fill, since a similar elevation to the east is poorly drained.

The facility has been totally disturbed and no further work was required.

Plate 70. Facility 14, Family Housing, Swansea, Mass.

Facility Name: Hingham
Facility Number: 15
Level of Investigation: Stage II
CDS: 6.4
ZES: 8.0
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. Fernandes (617) 749-6211

The Hingham facility was a naval ammunition assembly and storage facility acquired during World War II. It is presently used as a Reserve Center. Over two-thirds of the original area has been returned to local control and that part is now the Wampatuck State Forest. Just over two square kilometers remain as an intermittently used training area and storage facility.

Many of the building-sized magazines are still standing in various stages of collapse (See Plates 74, 76). The facility has been severely disturbed by the construction of these magazines and the railroad system used to move ammunition; even a small switching yard is located along the southeast perimeter. Other buildings and storage areas are used for stockpiling vehicles, a medical supply warehouse, an automotive shop and training buildings used in conjunction with the Reserve Center.

The terrain is one of glaciated hummocky swampland. Low areas are poorly drained while elevations have little soil deposition. The intermediate areas are not level. The bedrock crops out on high areas where soil has been removed either by glacial action or erosion (See Plate 73). Conifers grow on the thin acidic soils on the slopes and tops of hummocks while water tolerant species of maple, birch and oak, along with a thick undergrowth of ferns and other marsh vegetation, dominate the low areas. Areas that have been built up and cleared, such as roads and the edges of the natural vegetation, are dominated by species of the oak family.

Although four prehistoric sites were located within a mile of the facility, numbers 15-20, 15-21, 15-25, and 15-26, the area within the facility appears to be of low sensitivity, primarily because of the topographic and edaphic conditions here. There are no streams or lakes within 800 meters of the facility. All the prehistoric sites mentioned above are located 1000 meters to the west on higher and better drained ground overlooking the Weir River to the west. Although settled early, the Village of Hingham to this day does not come as far east as the facility. The historical sketch of Hingham appended to Chapter 4 does not apply to the facility but to the Village of Hingham about two kilometers to the west and the Village of Cohasset about two kilometers to the northeast.

A total of 338 testpits were dug to examine 776,000 square meters of testable area. The facility was broken up into nine areas. These areas do not represent different ecological or topographic zones, since the

whole facility is homogeneous in that respect. The division into nine areas was strictly for administrative purposes. Table 15 shows each area, the number of testpits dug and the size of the area.

Area	Acres	Number of Testpits
A	28.2	57
B	12.3	28
C1	55.2	100
C2	30.7	44
D1	14.7	25
D2	12.3	22
D3	24.6	40
D4	17.3	21

TABLE 15: Acreage and Testpit Distribution at Hingham, Mass.

One additional testpit was dug in the parking area in front of the building T-90. An unmodified unutilized flake was found here on the surface. A testpit dug here failed to produce any other evidence or artifact suggesting aboriginal activity. Due to this fact and the lack of context no further work is needed here. This flake represents the only prehistoric cultural material found during the entire survey.

The topography and soils of the area are uniform throughout. The facility lies in an area of glaciated upland terrain with small hills or hummocks and low wet areas. Bedrock outcrops are common and the high areas have very little soil, either erosion or glacial scouring has removed most of it. The soil profile in these upper regions is a glacial orange sand with unsorted gravels throughout. The composite soil profile is given below:

0 - 10 cm. - Dark humic sand with lots of roots.
10 - 50 cm. - Orange sand with gravel.
50 cm. - Bedrock.

These upper regions support a thin forest of conifers, mostly hemlock and white pine, and deciduous trees such as birch and small amounts of shrub oak. The cleared areas or borders of cleared areas are thick with sapling maples, oaks, birches, beech and an incredible undergrowth of briars, sumac and poison ivy. The underbrush in the upper elevation woods is relatively sparse. Bedrock outcrops are localized but very common. In some areas there is no soil on the surface at all.

The lower areas are wet with standing water quite common. There are very few conifers here except in small localized dry areas. The forest floor is choked with ferns, cattails, mosses, and a variety of shrub, bushes and vines. The soil profile for the lower area is also quite consistant throughout the facility.

Although the elevation range on the facility is relatively small, no more than 15 meters, the relief is extreme at times. There are no real streams in the facility although the swamps drain into each other by narrow, and probably seasonal, feeders. At low elevations testpits rarely are able to go deeper than 50 cm. due to ground water. In the upper elevations bedrock is usually encountered by 60 to 70 cm.

There are some fairly level zones, primarily in area C2. These zones are intermediate or transitional between the upper and lower regions previously described. Disturbance in the area is quite extensive. The magazines and the railroads, support buildings and storage areas account for the majority of that disturbance. The magazines, after construction was finished, were covered with several feet of dirt, either for additional protection or camouflage. This fill was scraped up from the surrounding area, therefore the disturbance in the magazine areas is much more extensive than would appear to the casual observer. Based on the results of the Stage I and II investigation no further work was recommended.

Plate 71. Facility 15, Hingham, Mass. In the woods in an intermediate zone in area C2.

Plate 72. Facility 15, Hinghai., Mass.

Plate 73. Facility 15, Hingham, Mass. An area of little soil deposition showing bedrock outcrops. Areas like this are above the 30 meters contour.

AD-A134 734 AN ARCHEOLOGICAL SURVEY AT FORT DEVENS MASSACHUSETTS AND ITS OFF-BASE FACILITIES(U) HAMMER (JOHN) ALBANY NY J HAMMER ET AL. AUG 83 5891(79) 3/4

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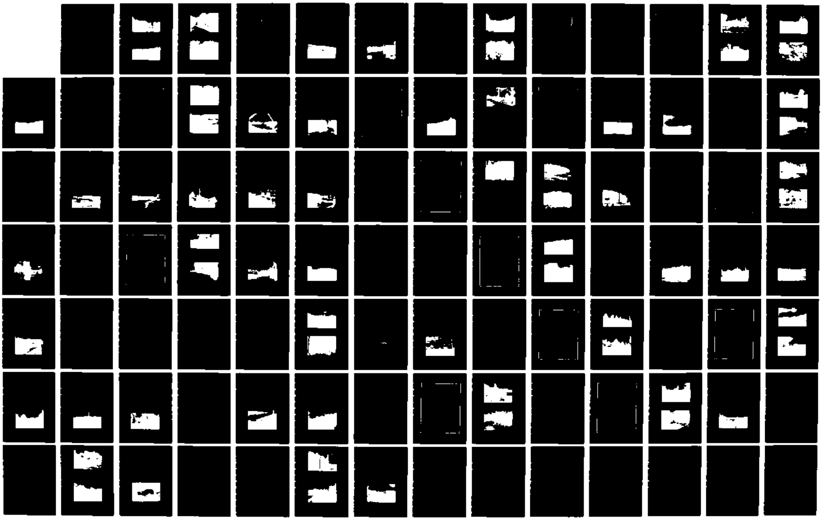
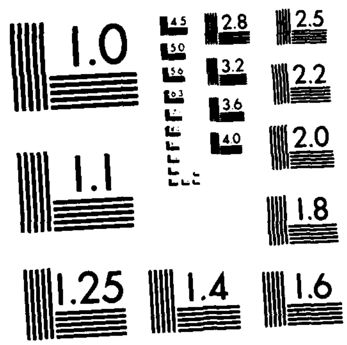




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Plate 74. Facility 15, Hingham, Mass. A view of a magazine. Note the large amount of fill at the left of the magazine.

Plate 75. Facility 15, Hingham, Mass. An old storage building and freight area now used as a motor pool.

Plate 76. Facility 15, Hingham, Mass. A magazine in area A. The magazine extends to the right 50 meters.

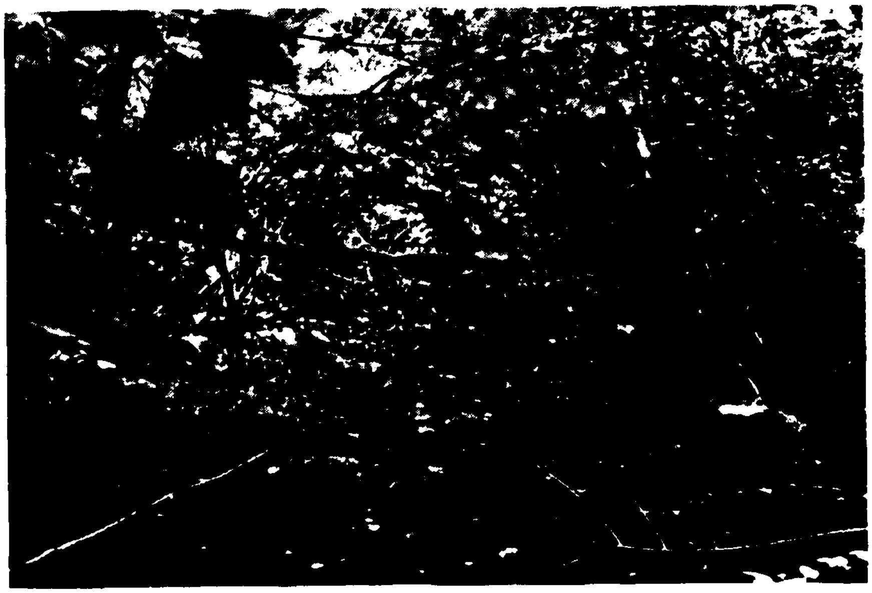
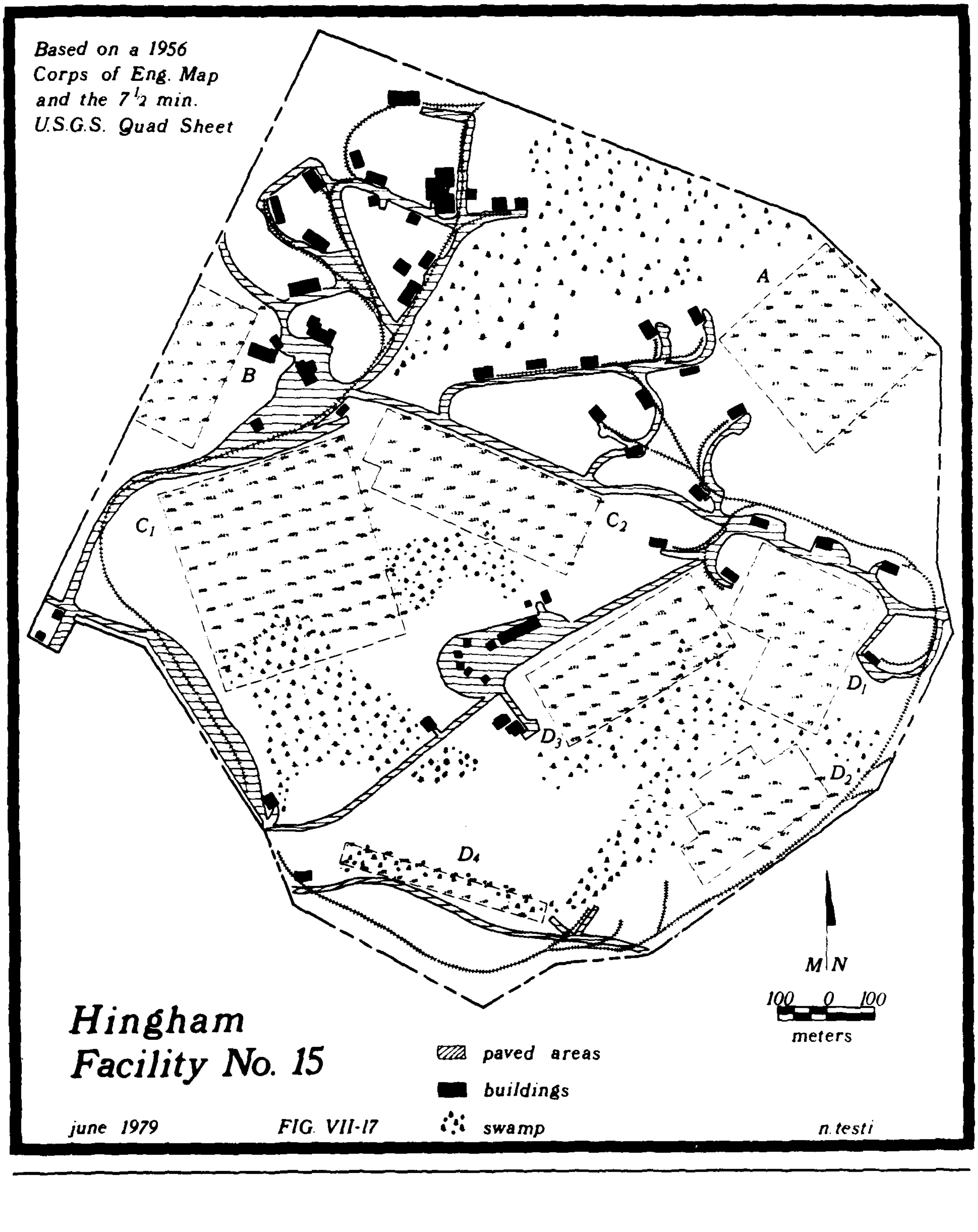


Plate 77. Facility 15, Hingham, Mass. A swampy area in the lower zone in area D-3.


Based on a 1956
Corps of Eng. Map
and the 7 1/2 min.
U.S.G.S. Quad Sheet
A
B
C_1
C_2
D_1
D_2
D_3
D_4
M N
100 0 100
meters
Hingham
Facility No. 15
paved areas
buildings
swamp
june 1979
FIG. VII-17
n. testi

Facility Name: New Bedford
Facility Number: 16
Level of Investigation: Stage I
CDS: 5.4   ZES: 14.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. F. Cormier (617) 994-4677

This facility is a United States Reserve Center which is located on Clark Point in New Bedford, Massachusetts. The nineteenth century section of the old Fort Rodman has been turned over to local civilian control. The older portion of the Fort, FD-19, is an historic site that has already been placed on the National Register of Historic Places and is no longer under Federal control. The facility itself is all modern, circa 1950, and disturbed; no further work was recommended.

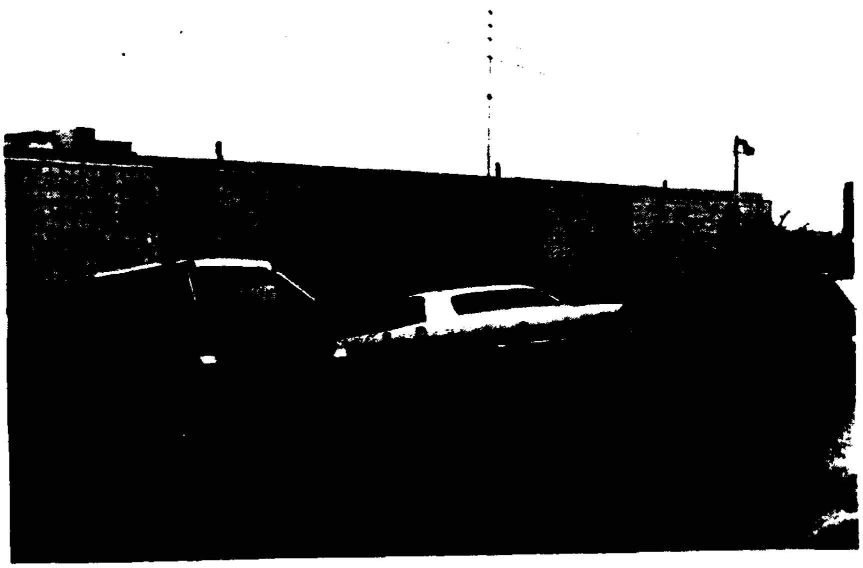


Plate 78. Facility 16, Reserve Center, New Bedford, Mass.

Facility Name: Attleboro
Facility Number: 17
Level of Investigation: Stage I
CDS: 3.0 ZES: 17.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Guarino (617) 222-3754

This facility is a reserve center which is located at the intersection of John William and Thatcher Streets, Attleboro, Massachusetts. Several prehistoric sites have been discovered in and near the Town of Attleboro. The facility is located on a flat rise overlooking Dodgeville Pond, which was artificially created by a dam at its southern end. Examination of the surrounding area suggests that Dodgeville Pond was a swamp before the dam was built. The drainage in the area is generally poor. Prehistoric Sites 17-28 and 17-29 are located approximately 800 meters north of the facility, Sites 17-25 and 17-26 are located 850 meters east of the facility while Sites 17-20, 17-22, 17-23, and 17-24 are located approximately 2 kilometers south of the facility. Historic site FD-20 is located about 900 meters north of the facility. There are no undisturbed areas remaining inside of the facility fence and no further investigation was recommended.

Plate 79. Facility 17. The Reserve Center at Attleboro, Massachusetts. The muddy area this side of the fence is the only unpaved spot on the whole facility. Note the contour of the original surface by the fence.

Facility Name: Brockton 1
Facility Number: 18
Level of Investigation: Stage II
CDS: 10.4
ZES: 11.0
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. Joseph Ferreria (617) 588-0987

This facility is a reserve center which is located on Manley Street, Brockton, Massachusetts. It is located on a well-drained rise in an area of generally poor drainage. This facility is locally known as the "old" center, while the "new" center, Brockton 2, is located around the corner to the southeast. Prehistoric site 18-66 is situated approximately 2 kilometers to the south. The test area of 2500 square meters was tested with five testpits: no cultural materials were recovered. The composite soil profile is given below:

0 - 10 cm. - Gray brown humus with gravel.
10 - 60 cm. - Gray and brown sandy clay with gravel.
60 - 100 cm. - Orange brown sandy clay with gravel.

The soil was very compacted, gravelly and with a high clay content. Several testpits had to be stopped at 60 cm. due to an impenetrable clay and gravel hardpan. There is a possibility that this area is filled. The trees on the facility are young pines, ash, shrub oak and birches. The trees appear to have been part of a landscaping effort. The normal vegetation according to Kuchler (1964) would have been the Appalachian Oak Forest. Based on the results of the Stage I and II investigation no further work was recommended.

Plate 80. Facility 18, Reserve Center, Brockton, Mass. View of the test area. The two wooded areas at either side were also tested. The U.S.V.A. hospital is in the background.

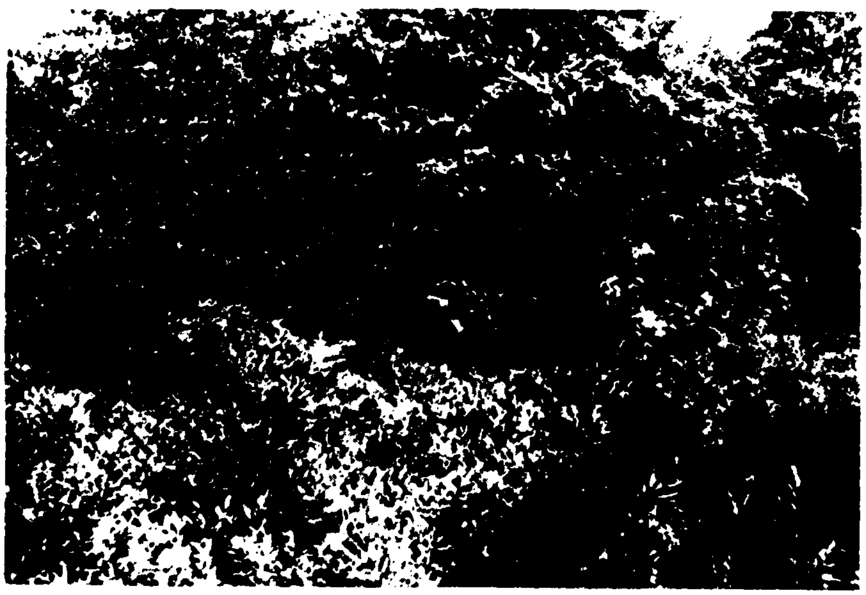


Plate 81. Facility 18, Reserve Center, Brockton, Mass.

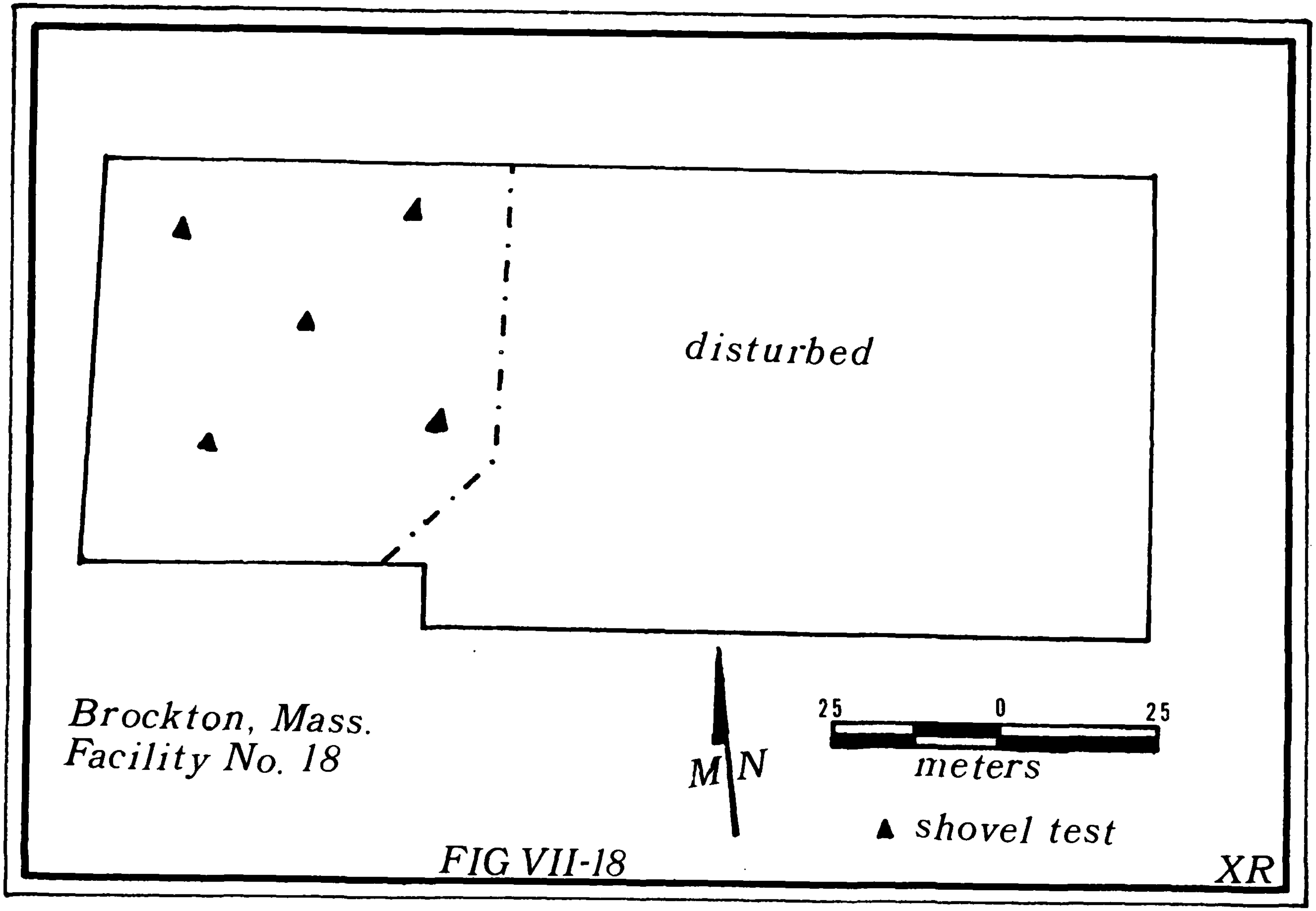

disturbed
Brockton, Mass.
Facility No. 18
M N
25 0 25
meters
shovel test
XR

FIG VII-18

Facility Name: Granby
Facility Number: 19
Level of Investigation: Stage II
CDS: 7.8 ZES: 13.5
Disturbance Type: 0, 1, 2, 4
Cultural Resources Sensitivity: High
Contact:

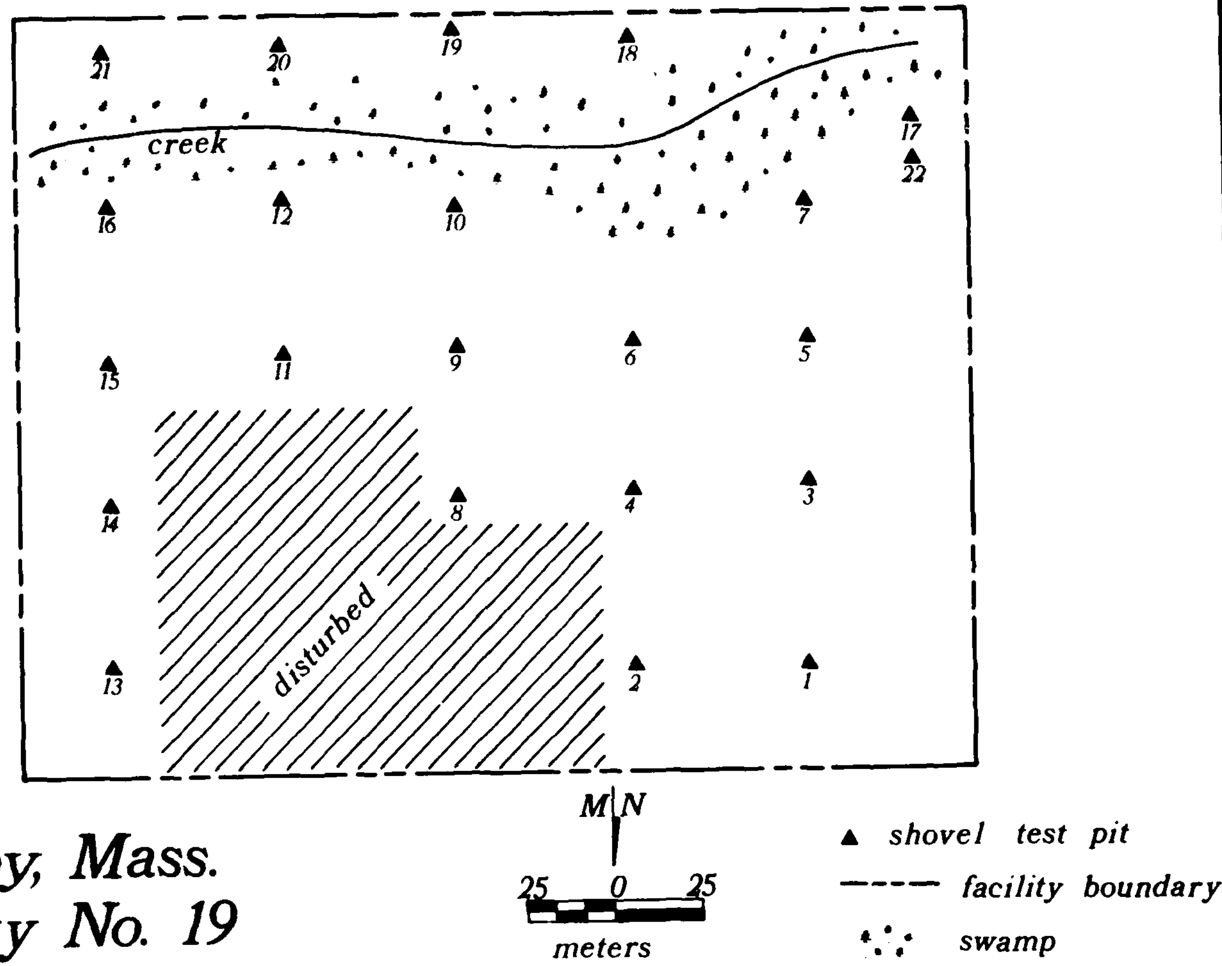
The Granby facility is located on Carver Road in the Town of Granby, Massachusetts. There are two prehistoric sites, 19-50 and 19-8, which are one and two kilometers respectively, southwest of the facility. This facility is a training site for reservists in the Springfield area. The front (north) section of the facility has been somewhat disturbed by levelling and by the construction of a training area and a 1930's brick building. The rear of the facility, however, seems undisturbed and is in a good location on a bank of a small creek and swamp.

The facility at one time extended north across Carver Road but that parcel has been returned to civilian control and is now a Town park and playground. The 28,500 square meter test area was examined with 21 testpits and no cultural materials, except a Listerine bottle and a piece of a radio, were recovered. The Granby facility was farmland before the military acquired it. Note the farm houses across Carver Road in Plate 83. Two composite soil profiles are presented, Zone A for testpits 1 through 17 and 22, and Zone B for testpits 18 through 21. These correspond to two quite separate ecological zones located at the facility.

Zone A:
- 0 - 10 cm. - Dark brown humic layer.
- 10 - 30 cm. - Very dark brown coarse sand with lots of gravel.
- 30 - 80 cm. - Coarse brown sand with gravel and significant clay content. Some areas becoming quite compacted.
- 80 - 100 cm. - Light brown sand with gravel, soil getting moist.

Zone B:
- 0 - 20 cm. - Brown sandy humus.
- 20 - 70 cm. - Brown sand.
- 70 - 100 cm. - Gray clays, water in testpits.

Wherever clays are found the ground water is held above them. Some testpits in Zone A have clay layers between 30 and 80 cm. Once the testpit went below this depth, the water from above the clay would run into the sandy bottom of the pit. There is much localized disturbance in terms of trenches, fox holes and concrete tower footings. Drainage, especially near the creek, is poor. The dominant vegetation is shrub oak, conifers, and swamp plants such as ferns. Based on the results of the Stage I and II investigation no further work was recommended.



Granby, Mass.
Facility No. 19

a. krievs

FIG. VII-19

n. testi

Plate 82. Facility 19, Training Facility, Granby, Mass. This is the disturbed part of the facility. Note the evidence of scraping in the left foreground. The area to be tested is behind the camera.

Plate 83. Facility 19, Granby, Mass. The test area in Zone A. The various poles are some type of training device.

Plate 84. Facility 19, Granby, Mass. Localized disturbance in Zone A. The wooden reinforcement in the center foreground shores up the wall of a trench.

Plate 85. Facility 19, Granby, Mass. In the swampy woods in Zone B.

Facility Name: Brockton 2
Facility Number: 20
Level of Investigation: Stage I
CDS: 7.4 ZES: 14.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. J. Flynn (617) 584-4759

This facility is the new reserve center at 915 West Chestnut Street, Brockton, Massachusetts. Prehistoric site 20-66 is located two kilometers to the southwest. The region is dotted with swamps and poorly drained areas. Slight elevations here are probably relatively good locations for prehistoric occupations. The original topography of this facility has been completely disturbed. This facility is paved from fence to fence and no further work is required.

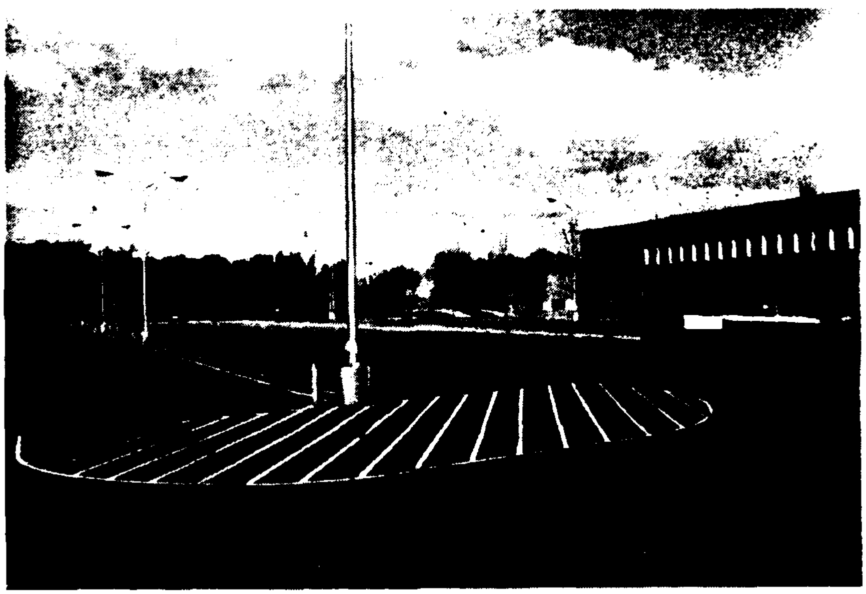


Plate 86. Facility 20, Reserve Center, Brockton, Mass.

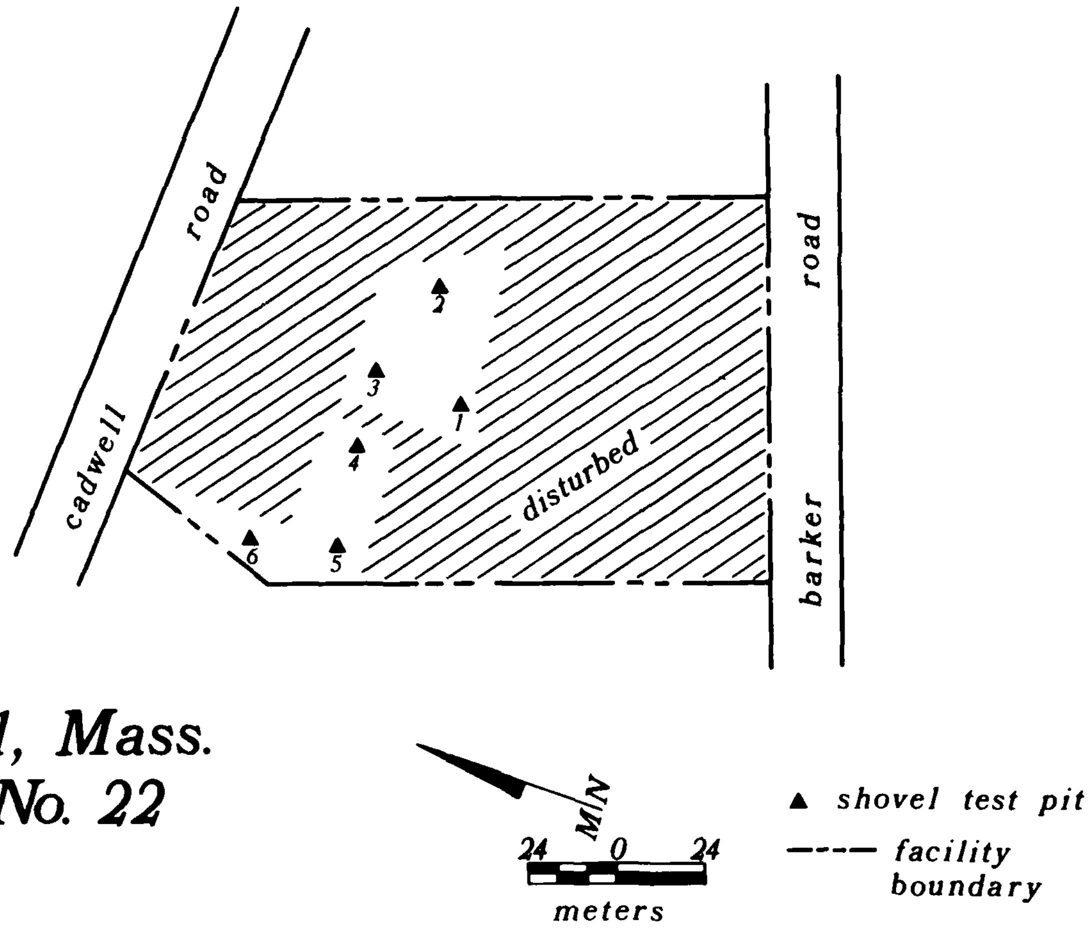
Facility Name: Pittsfield
Facility Number: 22
Level of Investigation: Stage II
CDS: 6.8 ZES: 15.0
Disturbance Type: 0, 1, 2
Cultural Resources Sensitivity: Low
Contact: Mr. George Hoxie

This facility is a reserve center located on Barker Street, Pittsfield, Massachusetts. Three prehistoric sites 22-4, 22-38, and 22-40 are situated two kilometers to the north and east of the facility. The Lebanon Village Shaker restoration is located about three kilometers west of the facility. The lower slope of the facility appears to be relatively undisturbed and opens onto the floodplain of Southwest Branch, a tributary to the West Branch of the Housatonic River, about 450 meters to the north. The prehistoric sensitivity of this facility is low due to the steepness of the slope, the absolute elevation, and the small size of the stream and its distance from the test area.

Approximately 5500 square meters were tested with six testpits, but no cultural materials were found. The upper slope is fill which was brought in to support the edge of the built-up parking areas on top of the bluff. A composite soil profile of the tested area is given below.

0 - 15 cm. - Gray brown topsoil.
15 - 40 cm. - Yellow and tan clay.
40 - 100 cm. - Gray and yellow sand with gravel.

Ash, maple, pine and birch were identified surrounding the facility. The facility has been cleared of all but a few trees and grass has been planted as an erosion preventative. The area at the bottom of the slope has been disturbed by a vehicle maintenance and storage area. Based on the results of the Stage I and II investigation no further work was recommended.



Pittsfield, Mass.
Facility No. 22

june 1979

FIG. VII-20

n. testi

Plate 87. Facility 22, Reserve Center, Pittsfield, Mass. The filled in and built-up support for the parking lot can be seen at the upper right under the parked car.

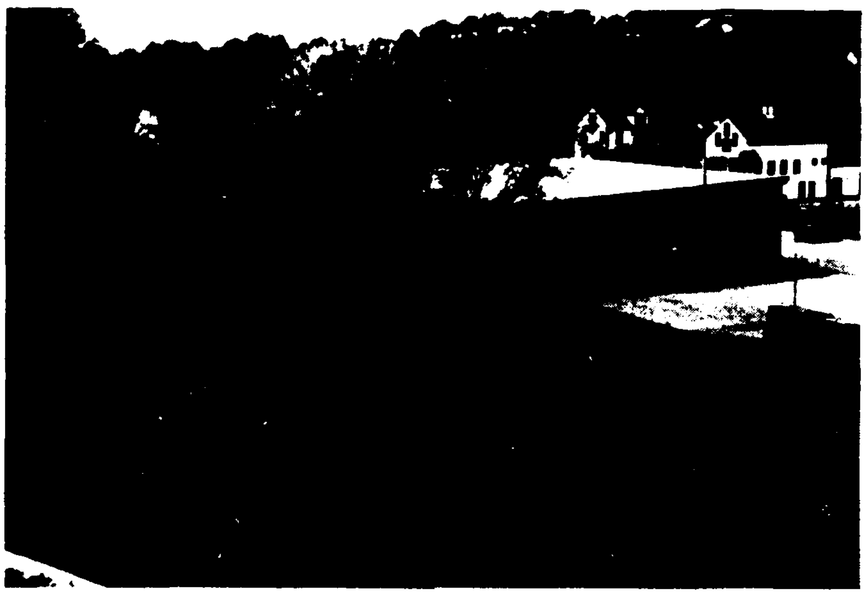


Plate 88. Facility 22, Reserve Center, Pittsfie1d, Mass. Looking down the slope towards the motor vehicle maintenance and storage area. The slope is quite steep in certain areas. Route 20 and the Southwest Branch run in back of the wooded hill in the background.

Facility Name: Roslindale
Facility Number: 23
Level of Investigation: Stage I
CDS: 10.8 ZES: 13.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Dumont (617) 325-0292

This facility is a reserve center located at 675 American Legion Highway, Roslindale, Massachusetts. Prehistoric sites 23-26, and 23-30 are located approximately two kilometers northwest of the facility in the Arnold Arboretum. The original topography of the facility has been destroyed. This facility is paved from fence to fence and no further work was recommended here.

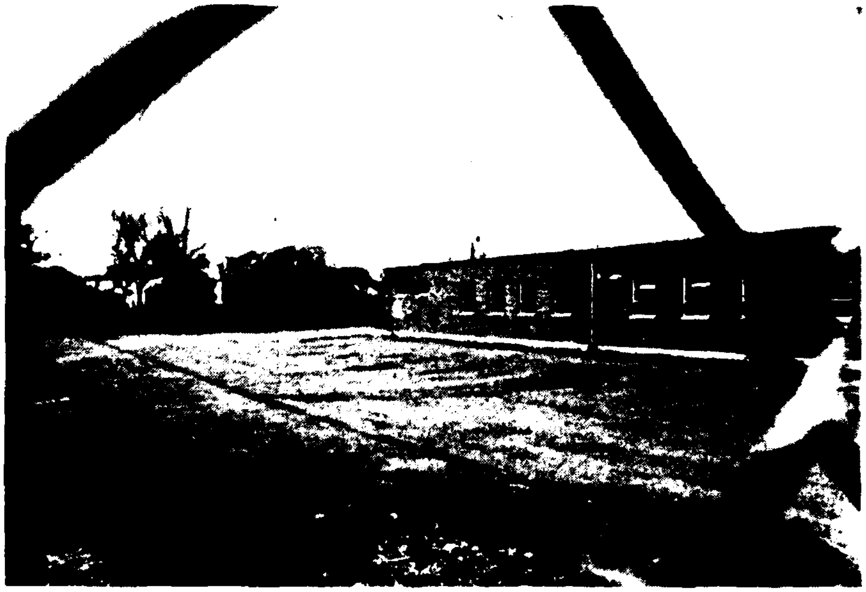


Plate 89. Facility 23, Reserve Center, Roslindale, Massa.

Facility Name: Springfield
Facility Number: 24
Level of Investigation: Stage II
CDS: 6.0 ZES: 21.0
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. William Grenier (413) 773-9726

This facility is a reserve center located at 50 East Street, Springfield, Massachusetts. It is located on a bluff about two kilometers south of the Connecticut River, about 25 meters above the river and 400 meters back from the bluff edge. A prehistoric site, 24-60, lies 1.2 kilometers north of the facility on the floodplain of the Connecticut River.

There is a 5000 square meter area of undisturbed pine woods at the western edge of the facility which is located in an area of high prehistoric sensitivity. This portion of the Springfield facility was tested with seven testpits according to the high density sampling method. The test area appears to have been reforested approximately 30 years ago with white pine. The area is criss-crossed by tire and tracked vehicle tracks but this disturbance appears to be only superficial. Seven testpits were dug in this area but no cultural materials were discovered. Some small and sorted gravel was found in the 50 to 100 cm. levels indicating glacial lake sediments. Based on the results of the Stage I and II investigation no further work was recommended. The composite soil profile is given below.

0 - 10 cm. - Dark brown humic layer with many pine needles.
10 - 30 cm. - Dark brown sandy loam.
30 - 70 cm. - Brown coarse sand.
70 - 100 cm. - Light brown sand.

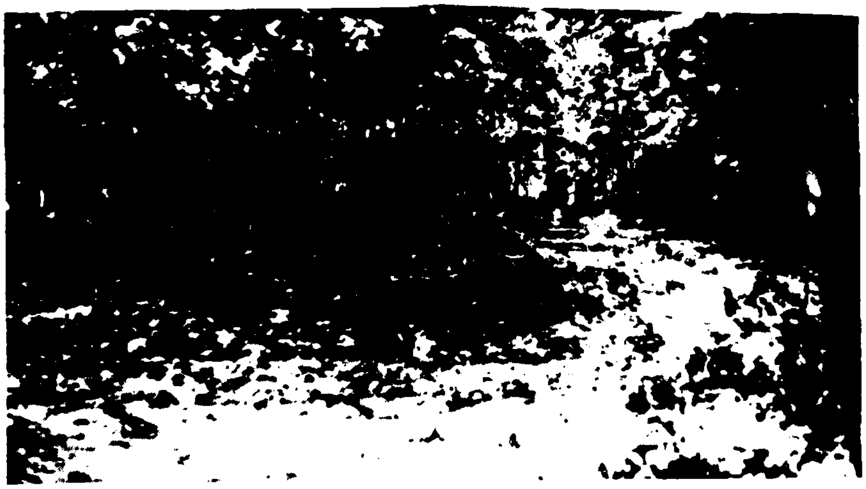
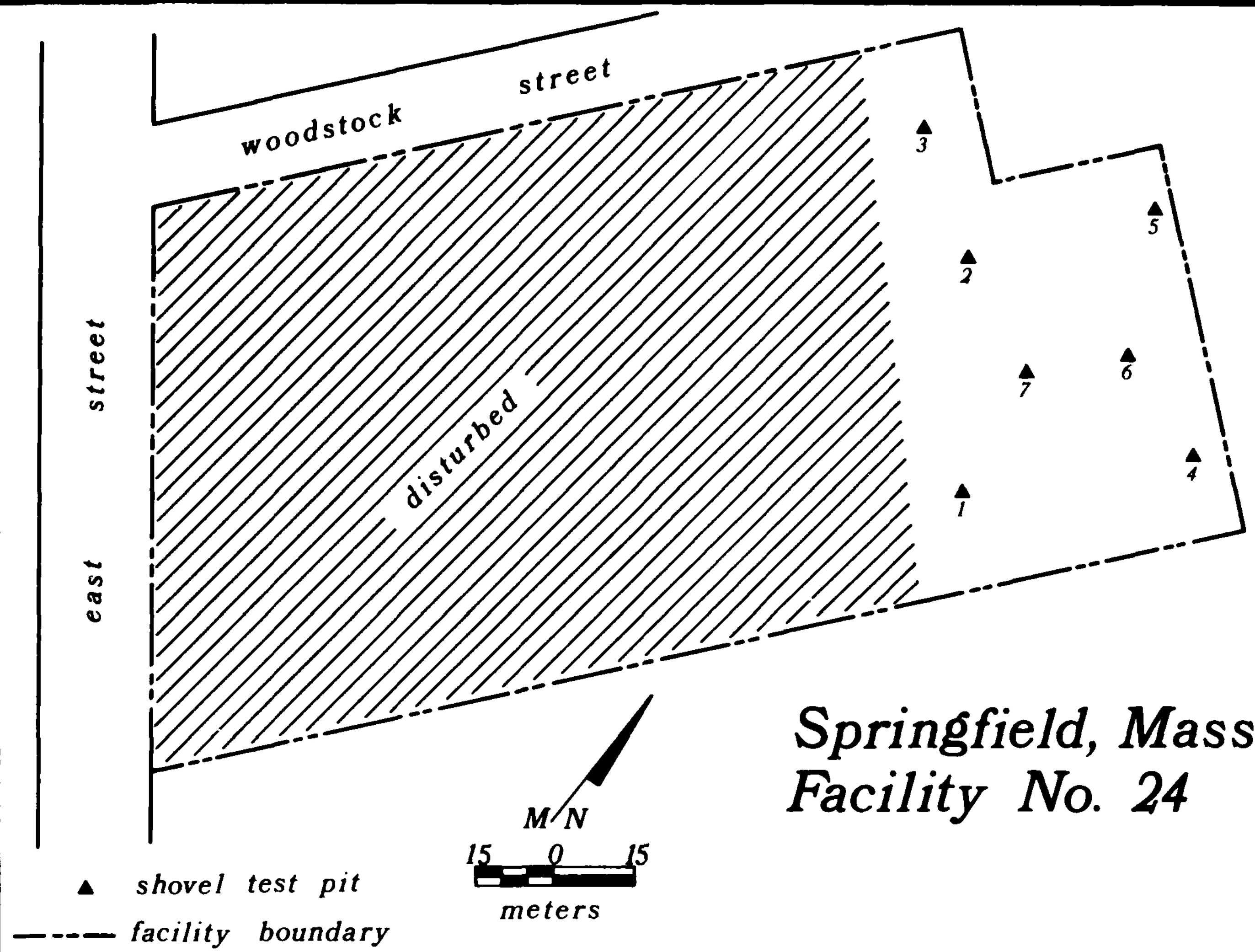


Plate 90. Facility 24, Reserve Center, Springfield, Mass. The test area at Springfield. Note the jeep trail in the center of the photograph.



Springfield, Mass. Facility No. 24

june 1979 FIG. VII-21 n. testi

Facility Name: Topsfield
Facility Number: 25
Level of Investigation: Stage II
CDS: 12.0 ZES: 11.5
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. Hoell (617) 749-7555

This facility is an old Nike launcher area and a family housing unit. It is located off Newburyport Turnpike in the town of Topsfield, Massachusetts. Two historic sites, FD-29 and FD-30, are located 800 meters northeast of the facility, approximately 30 meters lower in elevation than the facility. Nothing inside the launcher compound itself is testable. Three other areas to the north and east of the launcher, totalling some 36,000 square meters, are testable. A 50% sample of 18,000 square meters was tested with 13 testpits. Some of these testpits were located south of the launcher on a gentle natural slope. The composite soil profile is fairly simple.

0 - 35 cm. - Brown clay and loam with gravel.
35 - 100 cm. - Brown sandy clay with gravel.

Several testpits were stopped around 60 cm. due to bedrock. The lower soils were very stony and compacted. The vegetation is thick brush, lots of poison ivy and poison sumac, milkweed, briars, shrub oak with conifers, ash and birch. Based on the results of the Stage I and II investigation no further work was recommended.

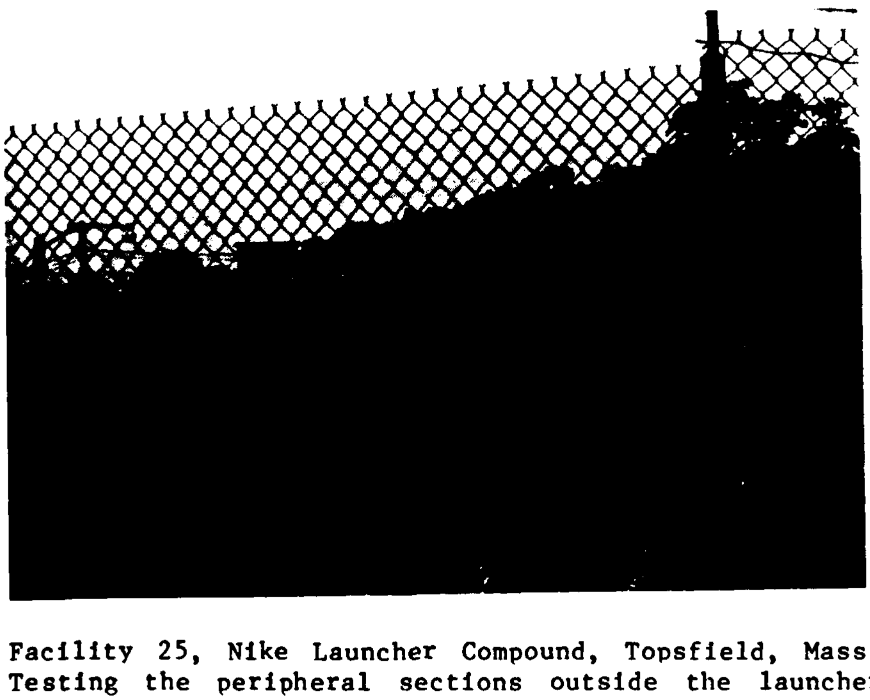
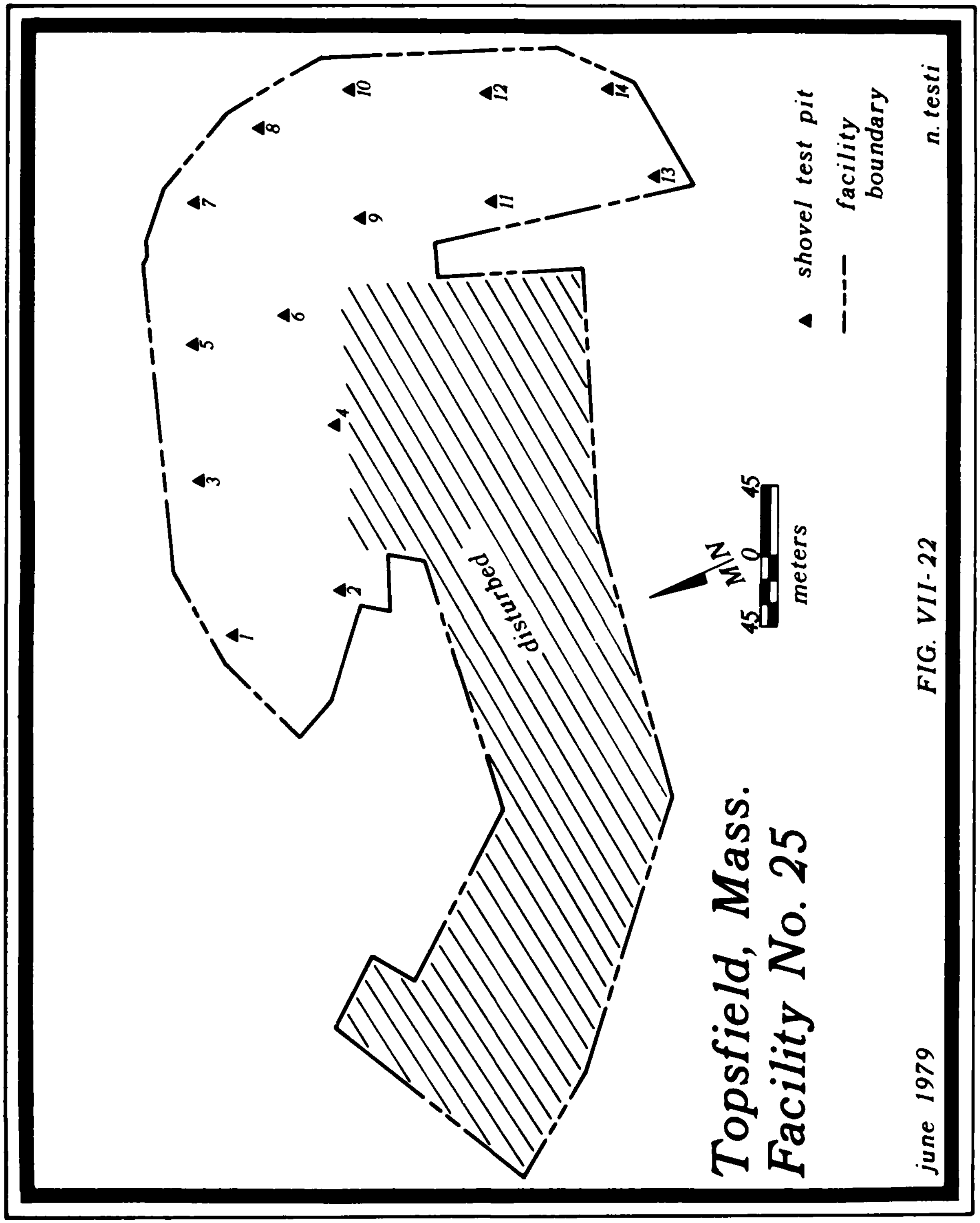


Plate 91. Facility 25, Nike Launcher Compound, Topsfield, Mass. Testing the peripheral sections outside the launcher compound.

Plate 92. Facility 25, Housing Area, Topsfield, Mass.


Topsfield, Mass.
Facility No. 25
june 1979
disturbed
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2
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4
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10
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12
13
14
N
M
45
0
45
meters
shovel test pit
facility boundary
n. testi

FIG. VII-22

Facility Name: Worcester
Facility Number: 27
Level of Investigation: Stage I
CDS: 4.8 ZES: 13.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. N. Svendsen (617) 757-8336

This facility is a reserve center which is located at 25 North Lake Avenue, Worcester, Massachusetts. The facility is ideally located overlooking Lake Quinsigamond, but it is paved fence to fence. Prehistoric site 27-186 is located approximately two kilometers to the south on the shore of the lake. Since the facility is totally disturbed, no further investigation was required.

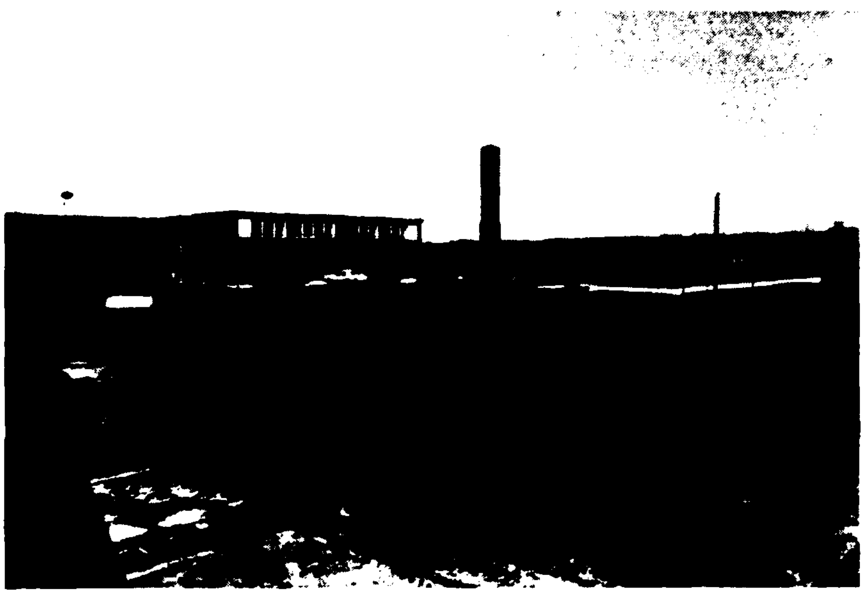


Plate 93. Facility 27, Reserve Center, Worcester, Mass.

Facility Name: Grenier Field
Facility Number: 28
Level of Investigation: Stage I
CDS: 13.0 ZES: 15.5
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is located on land acquired from the former Grenier Air Force Station. The original topography of the facility has been destroyed but it is located on a 30 meters bluff overlooking the Merrimack River. The entire area is paved and there are no known sites of any kind near the facility. No further work was necessary at this facility.

Plate 94. Facility 28, Reserve Center, Grenier Field, Manchester, N.H.

Facility Name: Manchester
Facility Number: 29
Level of Investigation: Stage II
CDS: 12.0 ZES: 15.5
Disturbance Type: 0, 1, 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. B. Winters (617) 796-3293

This is a reserve center located on College Avenue, Manchester, New Hampshire. The facility was closed when the initial investigation was conducted. No known sites are in the vicinity of the facility, although the SHPO feels this is a prehistorically sensitive area.

The front lawn on the eastern side of the facility appears to be undisturbed and slopes down onto the floodplain of the Piscataquoq Creek. Approximately 3500 square meters were tested with six testpits. There were no cultural materials recovered from this facility. A composite soil profile extends down to glacial sands and is presented below:

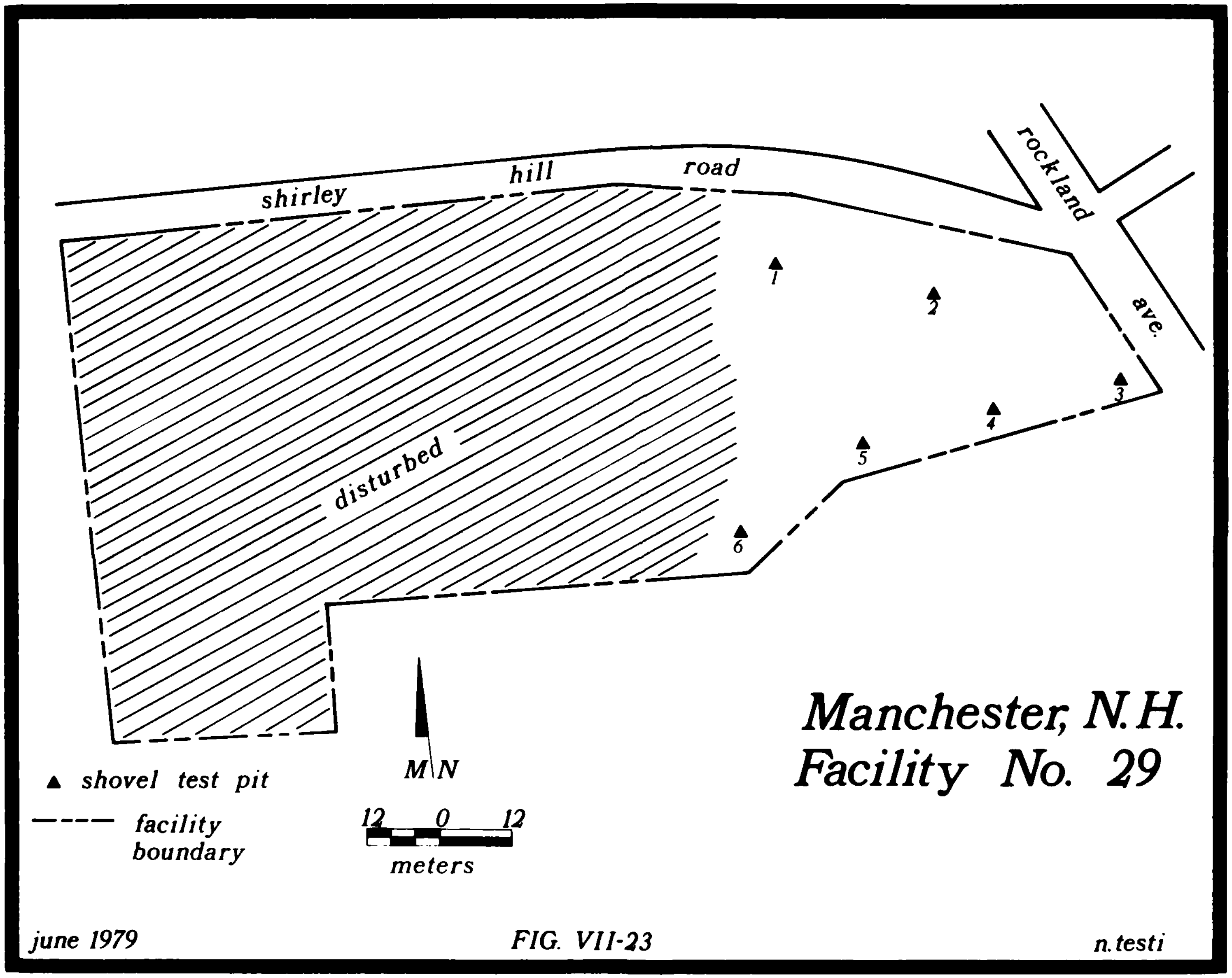
0 - 10 cm. - Dark brown humus.
10 - 20 cm. - Brown sand filled with crushed brick, tinfoil and burned trash, glass.
20 - 25 cm. - Lenses of yellow and tan sand.
25 - 40 cm. - Medium brown sandy soil.
40 - 100 cm. - Light brown, yellow sand with glacial cobbles and gravel.

The soil stratigraphy was uniform throughout and suggests that the area was filled for an unknown reason (See Plate 96). The subsoils appear to be sufficiently well drained and level. There was no evidence of structures on this portion of the facility although the surrounding neighborhood is typical small town residential and the land on which the facility is located was probably part of such a neighborhood prior to acquisition by the government.

A mixed group of deciduous and coniferous trees surround the area. There are no native trees on the facility itself. The Manchester facility is located in the New England Upland physiographic region which supports a floral community that is transitional between the Appalachian Oak forest and the Mixed Northern Hardwood forest. These forest types are obviously regional and local vegetation is dependent on edaphic conditions. Based on the results of the Stage I and II investigation no further work was recommended.

Plate 95. Facility 29, Reserve Center, Manchester, N.H. Testing the front lawn. The river is approximately 400 meters to the front.

Plate 96. Facility 29, Reserve Center, Manchester, N.H. Part of the test area. Note the edge of the filled area. The slope to the left reaches down to the original surface. The facility fence is in the trees on the left of the photo.


shirley hill road
rockland ave.
disturbed
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M N
12 0 12
meters
▲ shovel test pit
facility boundary
Manchester, N.H.
Facility No. 29
june 1979
n.testi

FIG. VII-23

Facility Name: Portsmouth
Facility Number: 30
Level of Investigation: Stage I
CDS: 6.4 ZES: 14.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. H. Kallacher (603) 436-1241

This facility is a reserve center, located at 125 Cottage Street, Portsmouth, New Hampshire. The facility is set back 80 meters from a riverside estuary in an area of generally poor drainage. Much of the facility has been filled in for levelling and improved drainage. There is no indication of any sites in the area of the facility and the facility is paved from fence to fence.

Plate 97. Facility 30, Reserve Center, Portsmouth, N.H.

Facility Name: Rochester
Facility Number: 31
Level of Investigation: Stage I
CDS: 15.0 ZES: 7.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. J. Watson

This facility is a reserve center located on South Main Street (Route 16), Rochester, New Hampshire. It is situated on high ground set back 2.4 kilometers from the Coheco River on stony and acidic soils. There is no indication of any sites in the area and the facility is totally disturbed.

Plate 98. Facility 31, Reserve Center, Rochester, N.H.

Facility Name: Davisville
Facility Number: 32
Level of Investigation: Stage I
CDS: 5.2 ZES: 14.0
Disturbance Type: 1, 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area which is attached to a larger United States Navy facility on Navy Drive, Davisville, Rhode Island. The facility is located in an area of poor drainage. The facility is totally disturbed and no further testing is recommended.

Plate 99. Facility 32, Family Housing, Davisville, R.I. The area in the foreground to the right of the road belongs to the United States Navy.

Facility Name: Lincoln
Facility Number: 33
Level of Investigation: Stage I
CDS: 14.0
ZES: 6.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: Low
Contact: Mr. Soscia (401) 333-1380

This facility is a maintenance depot located on Albion Road in Lincoln, Rhode Island. The facility is situated on a low hill in an area of glacial topography. There are no known sites within two kilometers of the facility. The facility is paved from fence to fence with the exception of a leachfield, and no further work was required.

Plate 100. Facility 33, Maintenance Depot, Lincoln, R.I. The area in the foreground has been built up with fill. The wet area to the right is a leachfield.

Facility Name: Bristol
Facility Number: 34
Level of Investigation: Stage I
CDS: 7.4 ZES: 14.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. J. A. Carlson (401) 253-3150

This facility is a reserve center which is located on Asylum Road, Bristol, Rhode Island. This facility is situated on a sandy slope set back 800 meters from Narragansett Bay. The area to the east is poorly drained. This facility is adjacent to Colt State Park, a proposed National Register Historic District. The facility, however, is a noncontributing part of the proposed District, meaning that the facility is physically present in the Park, but not included in the District proposal. Prehistoric site 34-7 is located two kilometers to the southeast of the facility and historic site FD-31 is located two kilometers to the east. This facility is totally disturbed and no further testing was required.

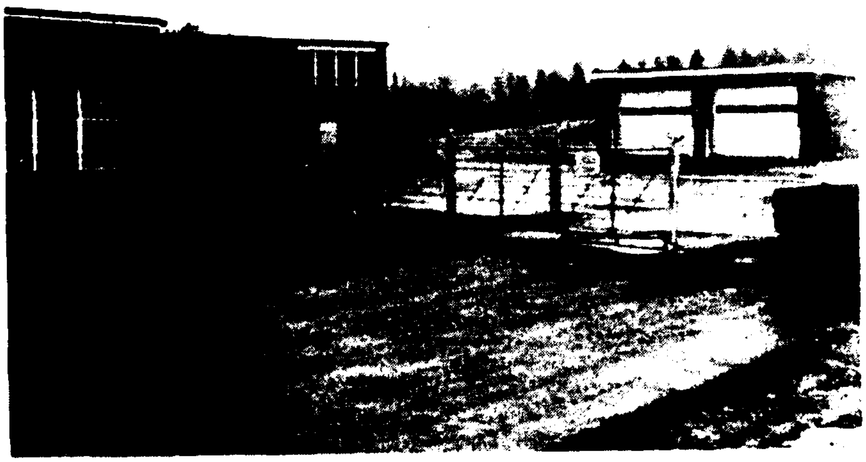


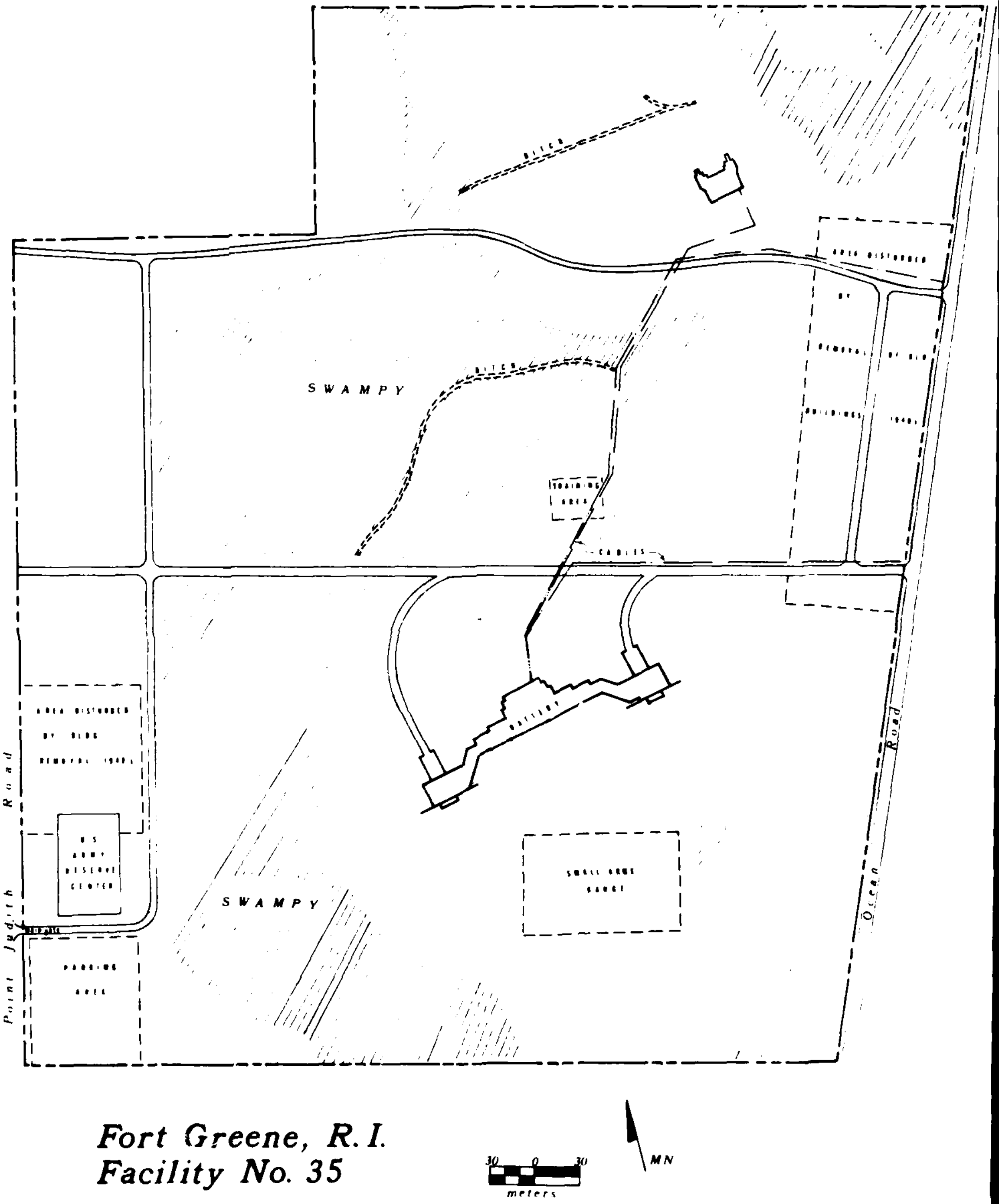
Plate 101. Facility 34, Reserve Center, Bristol, R.I.

Facility Name: Fort Nathaniel Greene
Facility Number: 35
Level of Investigation: Stage I
CDS: 4.8 ZES: 14.0
Disturbance Type: 0, 1, 2, 3, 4
Cultural Resources Sensitivity: Low
Contact: Mr. McGreenly (401) 789-7700
Mr. Joe Zychowicz (617) 992-6950

This facility is a reserve center and training area located on Point Judith, Rhode Island. The drainage on the facility is very poor with at least half of the area being wet year-round. The modern facility is located on a swampy flat on Point Judith. Narragansett Bay is 275 meters to the east. There are no historic sites on the facility, and there are no prehistoric sites within two kilometers of the facility. Prehistoric site 35-1 is located just over two kilometers northeast on Black-Point overlooking Narragansett Bay.

Fort Greene was built in 1941 and 1942 as a United States Army Coast Guard artillery shore battery, the main armament being two 16 inch rifled naval guns. Fort Greene was the last of a system of coastal batteries built to protect Narragansett Bay (Howarth n.d.). Much of the original installation has already been returned to State and local control. Due to the very flat terrain on Point Judith certain camouflaging devices were used during and after the initial construction. The fire control buildings were disguised as farm houses and dense shrubbery was planted over most of the area. One of the plants used was the Multiflora rosa, a tenacious and impenetrable relative of the rose family. This dense undergrowth makes subsurface testing virtually impossible. Several clearing schemes were discussed but a lack of funding and lead time caused us to develop a sampling strategy which would intensively test two small cleared areas, accounting for approximately 10% of the total area. During our initial visits it came to light that the possibility of buried ammunition existed. Although no one knows for sure if ammunition was buried there it was decided to hold off on any further investigation until a definitive determination about possible hazards and buried ammunition can be made.

Out of the total area of 470,000 square meters about 50,000 square meters are sufficiently cleared to be tested. These areas are shown on Figure VI-24. The rest of the facility is either disturbed, under water or so densely covered that even walking is impossible. Approximately 30 testpits should be dug here. The disturbed areas are the result of a filled, graded and paved parking lot, the new reserve buildings and the remains of the shore battery and ancillary buildings. Disturbed areas are marked on Figure VI-24. It is recommended that once a decontamination certificate has been found or a new one issued that Fort Devens contracts locally to perform the subsurface testing.



Fort Greene, R.I.
Facility No. 35

JUNE 1979 *FIG. VII-24*

Plate 102. Facility 35, Reserve Center, Fort Greene, R.I. Swampy area at Fort Greene.

Plate 103. Facility 35, Reserve Center, Fort Greene, R.I. Looking into an undisturbed area across the access road. Note the thick underbrush.

Plate 104. Facility 35, Reserve Center, Fort Greene, R.I. A look into the underbrush at Fort Greene.

Facility Name: Providence
Facility Number: 36
Level of Investigation: Stage I
CDS: 10.8 ZES: 14.0
Disturbance Type: 2, 3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

The facility is a reserve center which is located on Niagara Street, Providence, Rhode Island. The original topography at the facility has been obliterated. A prehistoric site, 36-9, is located within a 1.6 kilometers radius of the facility, as is the historic site FD-32, which has been listed on the National Register of Historic Places. The facility is located in an urban area and is either paved or covered with buildings from fence to fence. No further work was recommended.

Plate 105: Facility 36, Reserve Center, Providence, R.I.

Facility Name: Warwick
Facility Number: 37
Level of Investigation: Stage II
CDS: 5.0 ZES: 12.6
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. Olson (401) 738-5900

This facility is a reserve center located at 885 Sandy Lane, Warwick, Rhode Island. Prehistoric site 37-12 is located 800 meters north of the facility, across a swamp. There also is an old cemetery at the northern fence of the Warwick facility.

The 5000 square meter test area at Warwick proved to be a garbage dump. Only 4000 square meters were testable and five testpits were dug here. Testpit 23 was stopped at ten cm due to an impenetrable layer of garbage. The area might also have been filled since the soil is constant throughout except for a weakly developed humic layer in the wooded area. The vegetation in the area is primarily oak, maple, conifers and shrub. The cleared section at the northern fence is littered with surface garbage. The composite soil profile is very simple:

0 - 100 cm. - Brown sand with 20th century garbage, plastic, tinfoil, cans, pop tops, wrench, glass

It appears that during the construction of a baseball field just to the north of the facility that fill and garbage from that area were dumped on the reserve property. The late nineteenth century cemetery at the northeastern edge of the facility does not extend into the reserve center. The government did not acquire any land belonging to the cemetery. Based on the results of the Stage I and II investigation no further work was recommended.

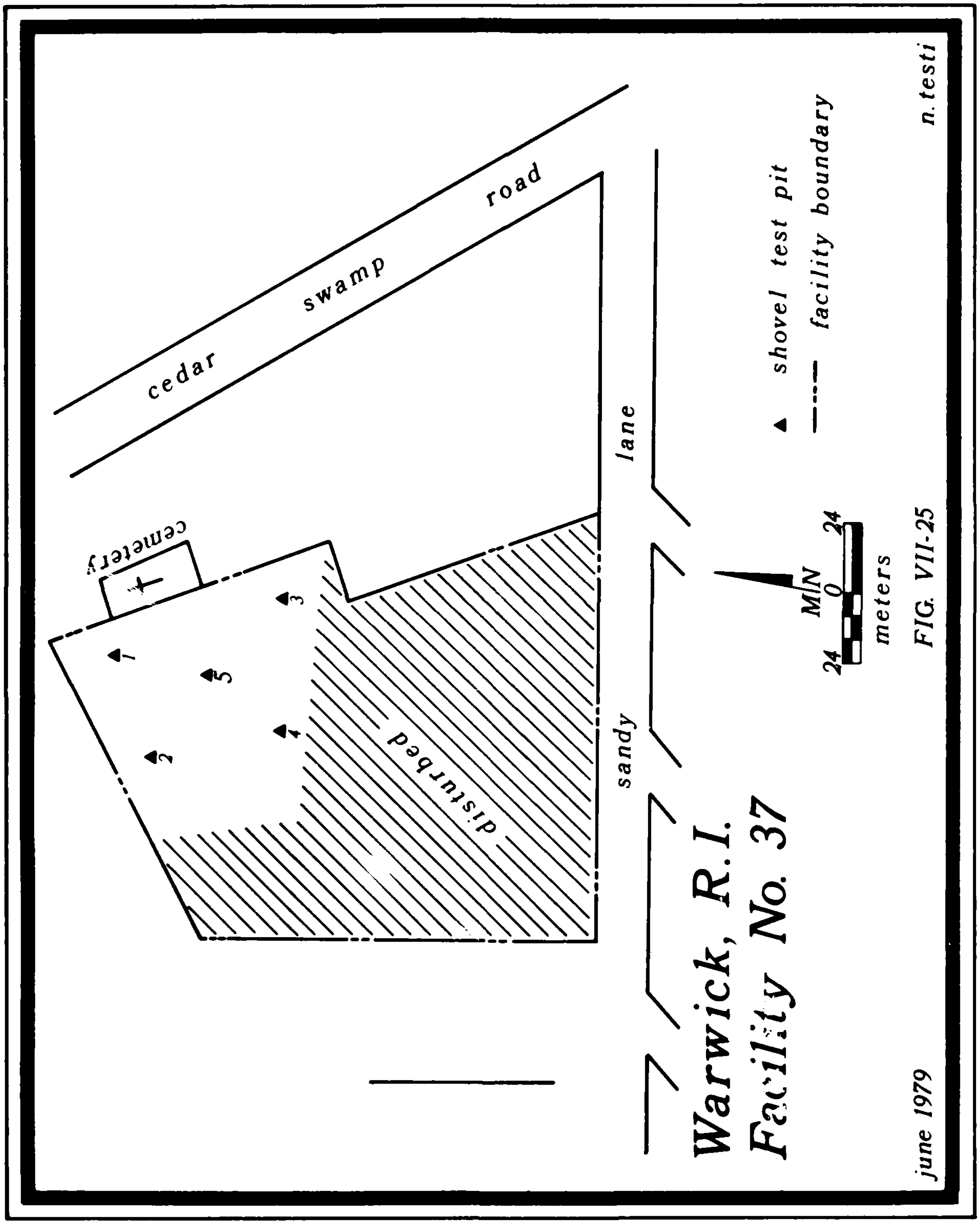

cedar swamp road
cemetery
disturbed
lane
sandy
shovel test pit
facility boundary
M N
24 0 24
meters
Warwick, R.I.
Facility No. 37
june 1979
n. testi
FIG. VII-25

Plate 106: Facility 37, Reserve Center, Warwick, R.I. The undisturbed area to be tested is shown. The cemetery is out of photo to the right.

Plate 107: Facility 37, Reserve Center, Warwick, R.I. The cemetery outside the fence. The cemetery does not extend onto the facility property.

Facility Name: North Smithfield
Facility Number: 38
Level of Investigation: Stage I
CDS: 5.0 ZES: 12.0
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

The facility is a family housing area which is located on Pound Hill Road, North Smithfield, Rhode Island. The facility is located on a slope in a poorly drained glaciated area overlooking a swamp. This facility should not be confused with the Air National Guard compound situated next to it. No sites of any type are known for the immediate area of the facility and the facility is totally disturbed. No further work is recommended.

Plate 108: Facility 38, Family Housing, North Smithfield, R.I.

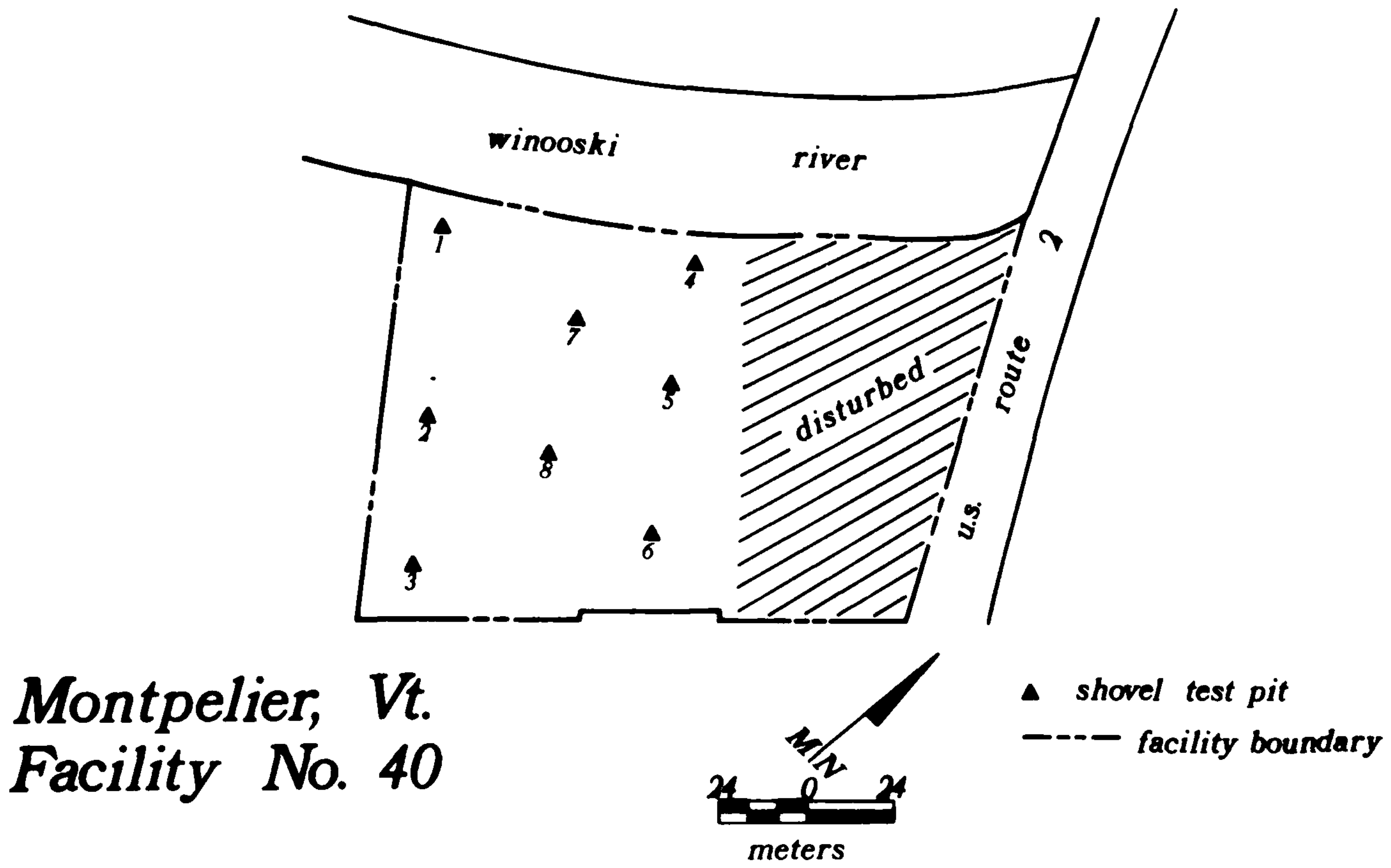
Facility Name: Montpelier
Facility Number: 40
Level of Investigation: Stage II
CDS: 5.0 ZES: 12.0
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. Silloway (802) 223-6496

This facility consists of a reserve center and a maintenance shop located at the junction of Routes 302 and 2, Montpelier, Vermont. There are no known sites of any type within 1.6 kilometers of the facility.

Approximately 9400 square meters were tested with eight testpits. No cultural materials were recovered. The composite soil profile is shown below:

0 - 20 cm. - Dark gray sandy loam.
20 - 100 cm. - Light gray sandy loam.

The survey crew was advised that the test area had been scraped and filled to level it probably because of seasonal flooding of the Winooski River. The lack of an A horizon in the soil profiles tends to bear this out. It appears that the sandy subsoil may not be glacial but of alluvial origin from seasonal flooding of the Winooski River. However, two testpits produced classically unsorted glacial gravels in a sandy matrix. Tin cans and an iron water pipe were found down to 40 centimeters. The facility is located in an area of mixed conifer-hardwood forests. There are no trees on the facility. Based on the results of the Stage I and II investigation no further work was recommended.



june 1979 FIG. VII-26 n. testi

Plate 109: Facility 40, Reserve Center, Montpelier, Vt. The test area at Montpelier. The gentle slopes on the right and left are certainly built up with fill which probably came from the lower ground in the center.

Plate 110: Facility 40, Reserve Center, Montpelier, Vt. The slope from the filled area down to the original surface at the right.

Facility Name: Rutland
Facility Number: 41
Level of Investigation: Stage I
CDS: 11.0 ZES: 6.5
Disturbance Type: 2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Chase (802) 773-7600

This facility is a reserve center located on North Street, Rutland, Vermont. The facility was closed at the time of the initial visit (3/17/79). The original topography of the facility has been obliterated. There are no known sites in the area of the facility. The facility is located in an urban section of Rutland and is totally disturbed. No work was recommended here.

Plate 111: Facility 41, Reserve Center, Rutland, Vt. View of the back of the facility showing filled in vehicle storage area. The original surface is under two meters of fill.

Facility Name: Winooski
Facility Number: 42
Level of Investigation: Stage I
CDS: 10.0 ZES: 18.0
Disturbance Type: 2,3
Cultural Resources Sensitivity: High
Contact: Mr. D. Crowley (802) 655-3645

This facility is a reserve center which is located in Winooski, Vermont, on land acquired from Camp Johnson. Woodland materials were found 800 meters to the east of the facility, overlooking the Winooski River. The facility is paved, and levelled, resulting in total disturbance. No additional work is required at the Winooski facility.

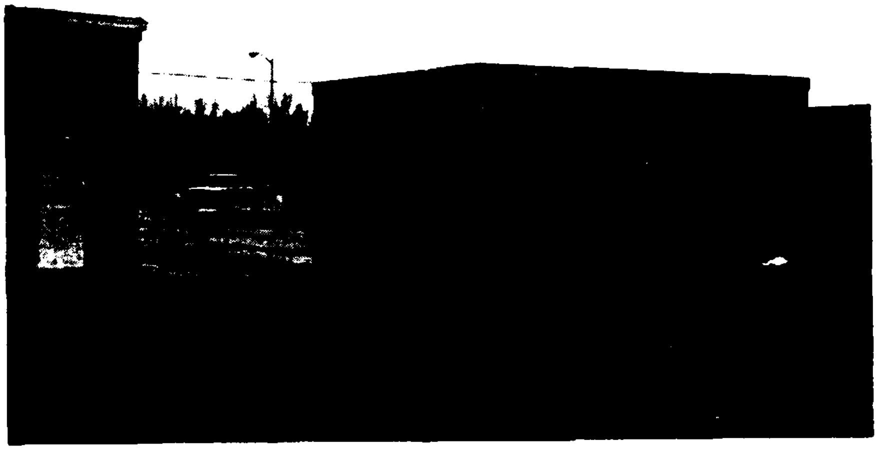


Plate 112: Facility 42, Reserve Center, Winooski, Vt.

Facility Name: Chester
Facility Number: 43
Level of Investigation: Stage I
CDS: 6.0 ZES: 11.0
Disturbance Type: 2,3,4
Cultural Resources Sensitivity: High
Contact: Mr. R. Landers (802) 875-2413

This facility is a reserve center which is located on Route 11, four kilometers west of Chester, Vermont. There are no known sites within 1.6 kilometers of the facility. The facility is situated on the floodplain of the Williams River. There is some undisturbed ground in the northwest corner of the facility, but it appears that erosion has carried away any desposition. A leach field extends under the northwest corner of the facility. In any event, construction for enlarging the Reserve Center is schedule to begin in this area April 1, 1979, and it is assumed that the Army Corps of Engineers have performed the proper cultural resource investigations. No further work is recommended for the Chester facility.

Facility Name: Middletown
Facility Number: 44
Level of Investigation: Stage II
CDS: 9.0 ZES: 14.0
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: Low
Contact: John Inzero (203) 632-2117

This facility is a reserve center, which was a Nike launcher, located on Mile Lane, Middletown, Connecticut. There are no known sites in the area. The test areas are located south and west of the launcher in the upper compound. The lower area is mostly disturbed by Type 2 and 3 disturbance. The facility is located on higher ground about three kilometers west and 45 meters above the Connecticut River in an area of low prehistoric sensitivity.

Three separate areas were tested at this facility, totalling 17,000 square meters in which 17 testpits were dug. The testpits were distributed as follows:

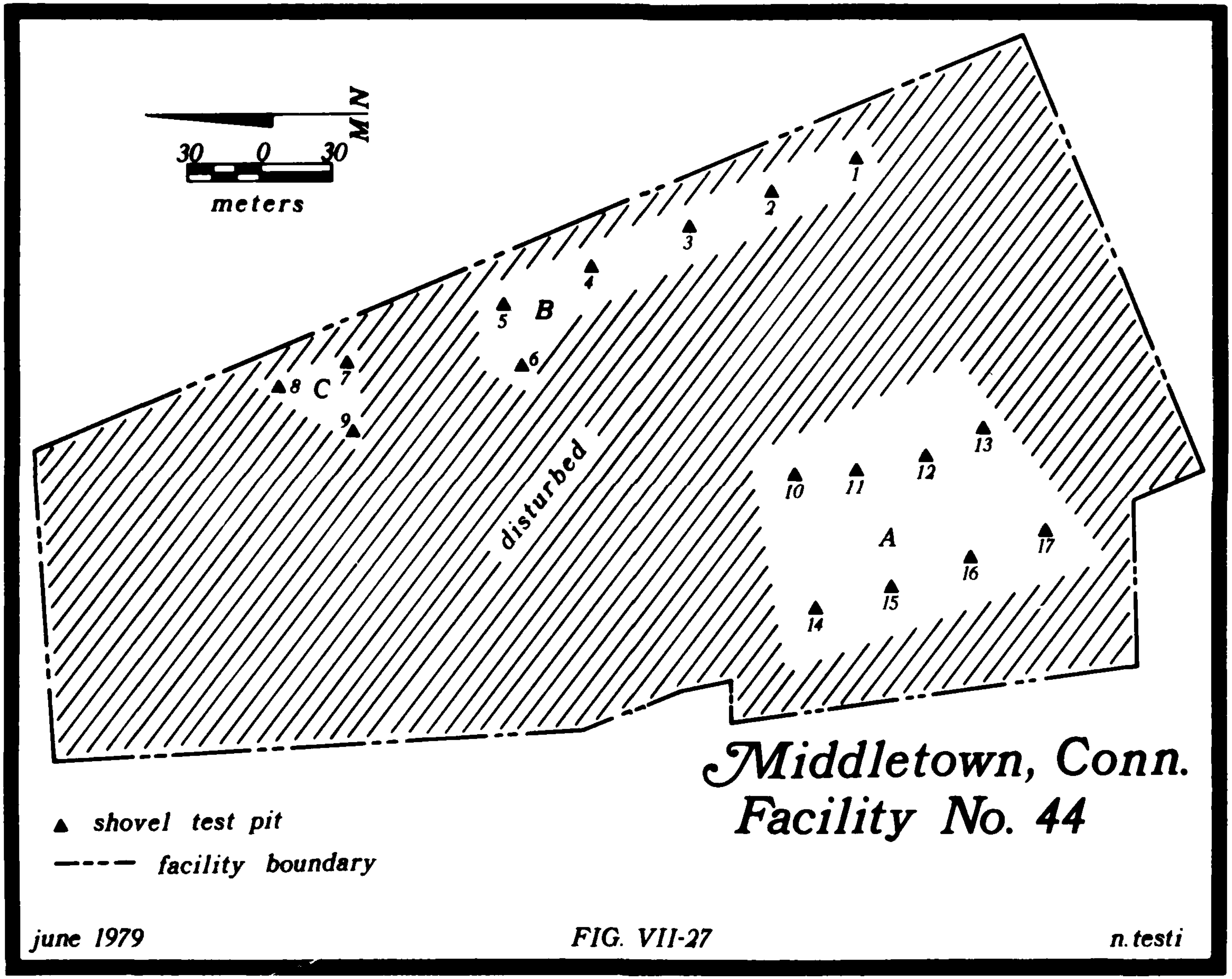
Area A	3 acres	8 testpits
Area B	1 acres	6 testpits
Area C	.3 acres	3 testpits
Total	4.3 acres	17 testpits

Although initially 140,000 square meters were projected as being possibly undisturbed, the sub-surface examination revealed that only 35,000 square meters were undisturbed. A 50% sample (following the low sampling density method) of 17,000 square meters was tested. The minimum numer of testpits for this size area is 13, using the formula given in Chapter 5. The crew chief placed additional testpits in undisturbed areas which appeared to be inadequately examined. The composite soil profiles are uniform for all three areas:

0 - 30 cm. - Dark rusty brown humic layer high in clay and gravel content

30 - 100 cm. - Reddish brown sandy clay with lots of gravel and cobbles which are probably of glacial origin.

There is the suspicion that much of the area is filled because it appears to be relatively level despite the fact that the facility is located on the east slope of a fairly steep hill. This facility was a Nike launcher site during the late 1950s and earth moving operations were quite extensive during construction of launchers. The vegetation in the area is primarily ash and maple, with some birch and a thick undergrowth of briars and shrub oak. The thick undergrowth is usually an indication of the first stages of a natural reforestation sequence re-establishing vegetational cover after extensive clearing and surface modification procedures. Based on the results of the Stage I and II investigation no further work was recommended.



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disturbed
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15
16
17
Middletown, Conn.
Facility No. 44
shovel test pit
facility boundary
june 1979
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FIG. VII-27

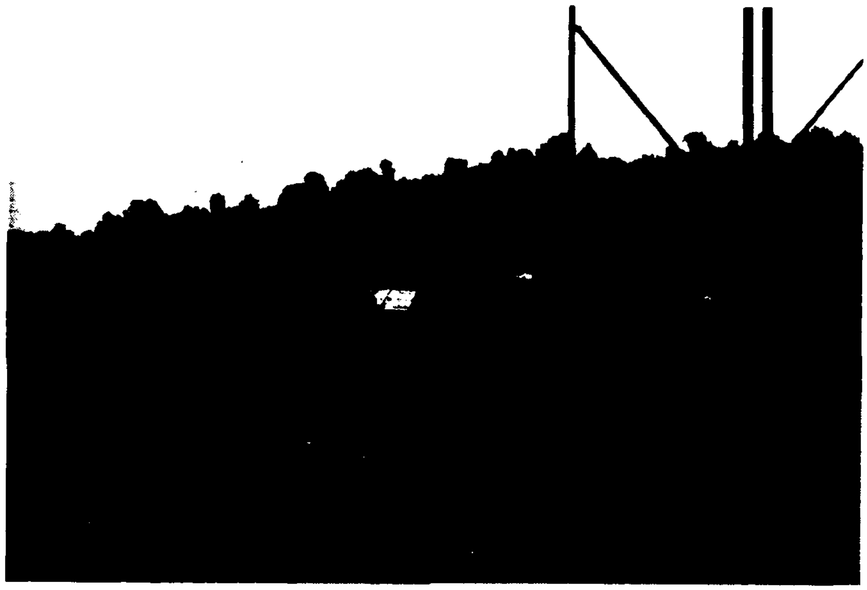


Plate 113: Facility 44, Reserve Center, Middletown, Ct. The launcher area located between Area A to the right and Area B to the left.

Plate 114: Facility 44, Reserve Center, Middletown, Ct. The original surface in the area of the facility. This is outside the facility, the fence being located just to the right of the photograph.

Facility Name: Milford
Facility Number: 45
Level of Investigation: Stage I
CDS: 10.4 ZES: 10.5
Disturbance Type: 2,3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a reserve center which is located at 26 Seemans Lane, Milford, Connecticut. The reserve center is located on a flat rise 800 meters from the nearest water. Poorly drained areas are located to the west and south. There are no known sites in the area of the facility, but the Connecticut State Historic Preservation Office feels the facility is located in a prehistoric archaeological sensitive zone. The facility is totally disturbed and no further work was required.

Facility Name: Manchester
Facility Number: 46
Level of Investigation: Stage I
CDS: 12.4 ZES: 13.0
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a 1950s family housing area located on Nike Circle, Manchester, Connecticut. Historic sites FD-33, FD-34, FD-35, and FD-36 are located 800 meters north of the facility. These sites are part of the Chewey Silk Mills Landmark district. The facility is situated on high ground in an area of glacial terrain. There is no evidence of prehistoric activity in the area, and no futher work was recommended.

Plate 115: Facility 46, Family Housing, Manchester, New Hampshire.

Facility Name: Ansonia
Facility Number: 47
Level of Investigation: Stage I
CDS: 13.0 ZES: 8.5
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. D. Gritman (203) 734-1688

This facility is an old Nike control site which is presently a reserve center. The facility is located on Ford Street, Ansonia, Connecticut. It is situated on a hill away from any streams in a glaciated upland region. There are no known sites in the area. The Ansonia facility is totally disturbed and no further work was recommended.

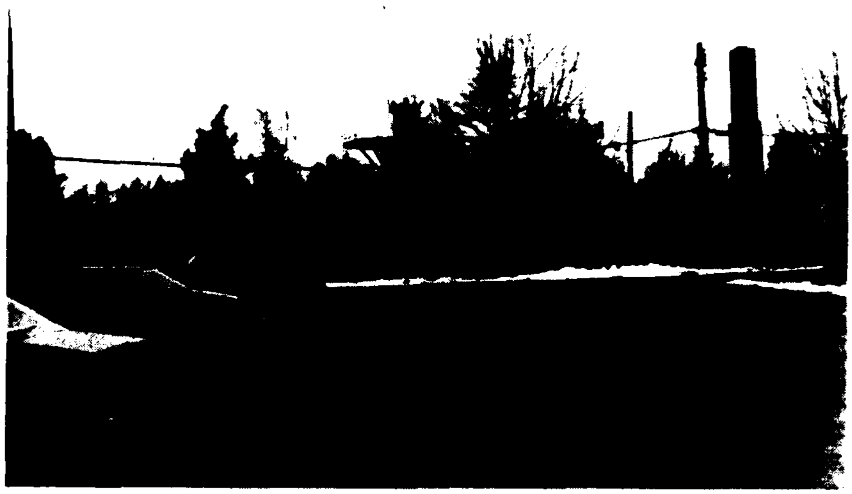


Plate 116: Facility 47, Reserve Center, Ansonia, Ct. The Nike control site (now reserve center). Note the three radar towers in back of the mess hall.

Facility Name: Ansonia
Facility Number: 48
Level of Investigation: Stage I
CDS: 9.0 ZES: 8.5
Disturbance Type: 2,3
Cultural Resources Sensitivity: Low
Contact: Mr. M. Feduik (203) 735-2533

This facility is a reserve center which was the Nike launcher associated with the control site at Facility 47. It is located on Osborne Lane, Ansonia, Connecticut. The launcher site is situated on a hill in a glaciated upland region some distance from the nearest stream. There are no known sites in the area of the facility. The facility is 100% disturbed and no additional work was recommended.

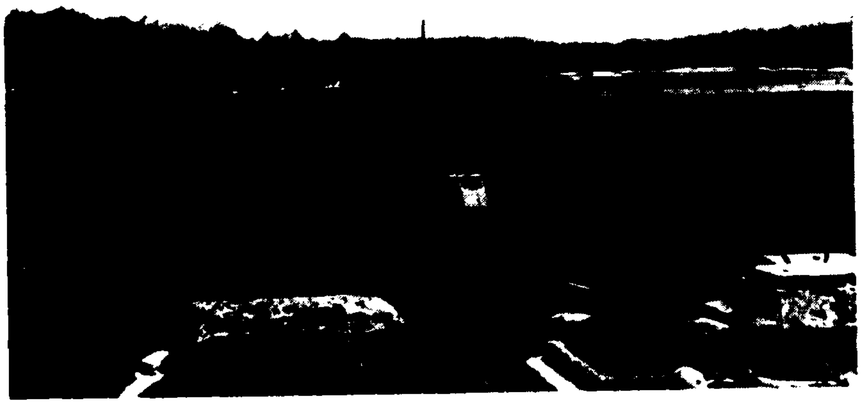


Plate 117: Facility 48, Reserve Center, Ansonia, Ct. The launcher at Ansonia.

Facility Name: Orange
Facility Number: 49
Level of Investigation: Stage I
CDS: 8.0 ZES: 9.0
Disturbance Type: 1,2
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area which is located on Smith Farm Road in Orange, Connecticut. The facility is situated on the slope of a hill in a poorly drained glaciated upland area. There are no known prehistoric or historic sites in the area of the facility. The Orange facility is totally disturbed and no further work was required.

Plate 118: Facility 49, Family Housing, Orange, Ct. The wooded area at the lower left is not part of the facility.

Facility Name: Milford
Facility Number: 50
Level of Investigation: Stage I
CDS: 10.4 ZES: 9.5
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility, located on Alpha Street, Milford, Connecticut, is a totally disturbed family housing area. The Nike launcher and control site part of the facility has been sold and is no longer under Federal control. The facility is located on a hill 25 meters above a poorly drained coastal area about 1.6 kilometers from Long Island Sound. There is no evidence of any sites in the area and no further work is recommended.

Facility Name: Fairfield
Facility Number: 51
Level of Investigation: Stage I
CDS: 6.4 ZES: 11.0
Disturbance Type: 2,3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a 1950s family housing area located in an urban setting on Quincy Street, Fairfield, Connecticut. The facility is located near areas of prehistoric and historic sensitivity. The Fairfield Historic District (FD-37) is located 800 meters north of the facility while the Southport Historic District is located three kilometers to the west. Prehistorically sensitive areas have been identified three to five kilometers to the north. The original topography of the facility has been obliterated. Due to the extensive disturbance, no further work was required.

Facility Name: Westport
Facility Number: 52
Level of Investigation: Stage I
CDS: 11.8 ZES: 13.5
Disturbance Type: 1,2
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a 1950s family housing area which is located on Wassel Lane, Westport, Connecticut. The facility is located on the slope of a slight rise in an area of poor drainage 800 meters east of Saugatuck River. Historic site FD-38, the Merrit Parkway, is located 100 meters north of the facility. The Westport facility is totally disturbed and no further work is recommended.

Facility Name: Shelton
Facility Number: 53
Level of Investigation: Stage II
CDS: 14.0 ZES: 4.5
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. Ritchie Bialekof (203) 929-6680

Shelton is divided into two parts. The first part is a family housing area on Palmetto Drive and the second part is the Nike control area just to the north of the housing area. The facility is located on top of a 200 meter quartz outcrop in a glaciated upland region. The nearest water is over two kilometers away. There is no evidence of historic or prehistoric sites on or near the facility. The housing area is totally disturbed (Type 2,3) and no further work is required at that portion of the Shelton facility.

A large portion of the missile control part of the facility on the eastern edge has already been sold. This undisturbed area is not the best in terms of potential aboriginal occupations due to the thin and acid soil overlaying quartzite bedrock which is often exposed, making this a low sensitivity area. The 10,000 square meter test area was examined with nine testpits; no cultural materials were discovered. There was very localized disturbance throughout the test area in the form of concrete tower footings, local fill mining and a discharge pipe from the leach field. A composite soil profile is given below:

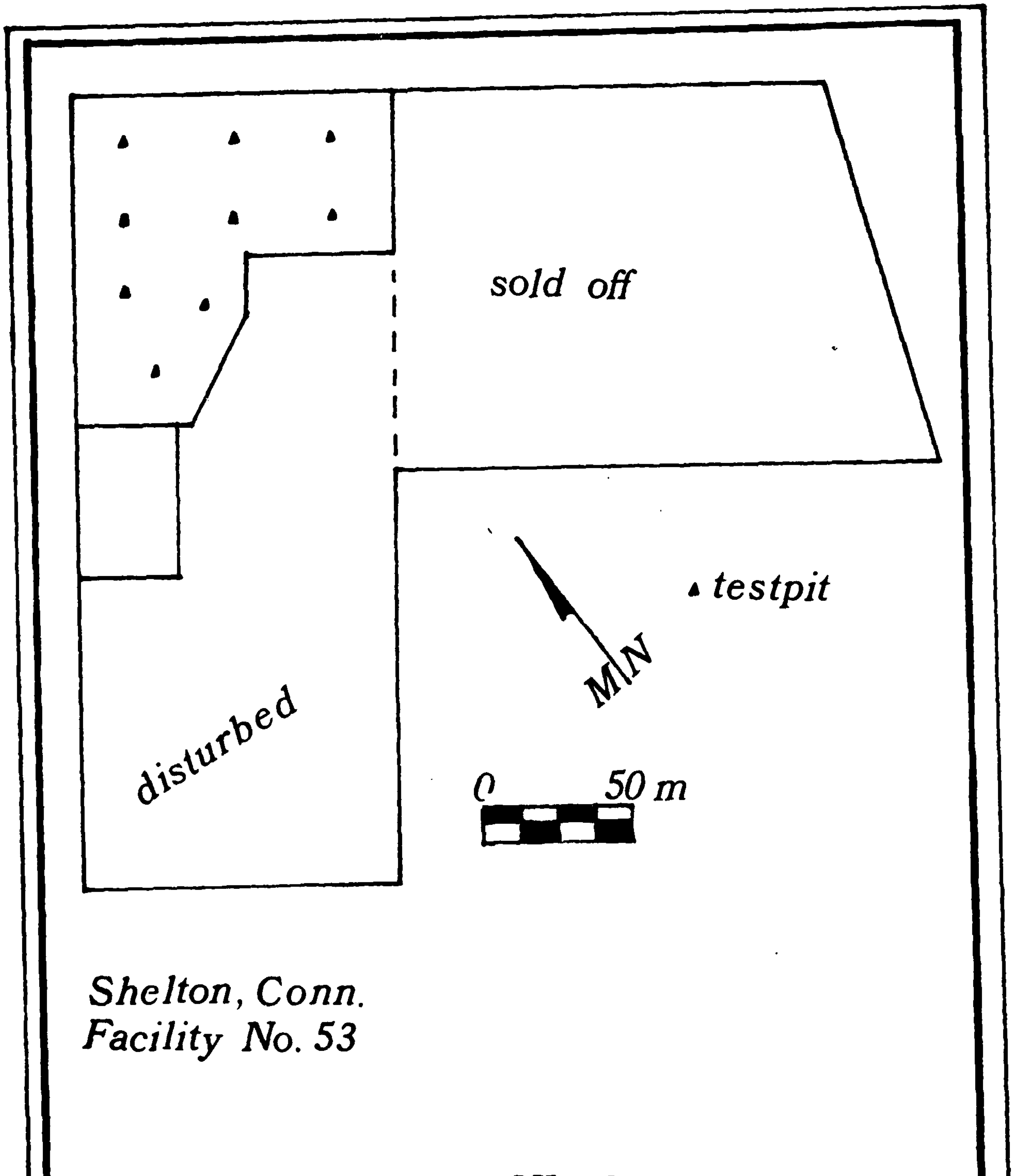
0 - 30 cm. - Brown humic clay with gravel.

30 - 90 cm. - Brown sand with clay and unsorted gravel.

Several testpits were terminated between 60 and 90 cm. due to bedrock and intense soil compaction. The vegetation surrounding the facility is comprised of ash, black birch, wild cherry, maple, poplar and shrub oak. Most of the trees are relatively young, supporting the suggestion that the whole area was cleared and perhaps levelled during initial construction of the Nike control site. Based on the results of the Stage I and II investigation no further work was recommended.

Plate 119. Facility 53, Reserve Center, Shelton, Ct.

Plate 120: Facility 53, Reserve Center, Shelton, Ct. The wooded part of the test area.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Shelton, Conn.
Facility No. 53
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FIG. VII-28

Facility Name: New Britain
Facility Number: 54
Level of Investigation: Stage I
CDS: 9.8 ZES: 13.0
Disturbance Type: 1,2
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area located on Rocky Hill Avenue and Green Street, New Britain, Connecticut. The general area of this facility was surveyed in 1977 by the Connecticut Archaeological Survey. No sites were found in the vicinity of the facility. This facility is located in an urban residential area of New Britain's industrial section. The facility is totally disturbed and no further work is required.

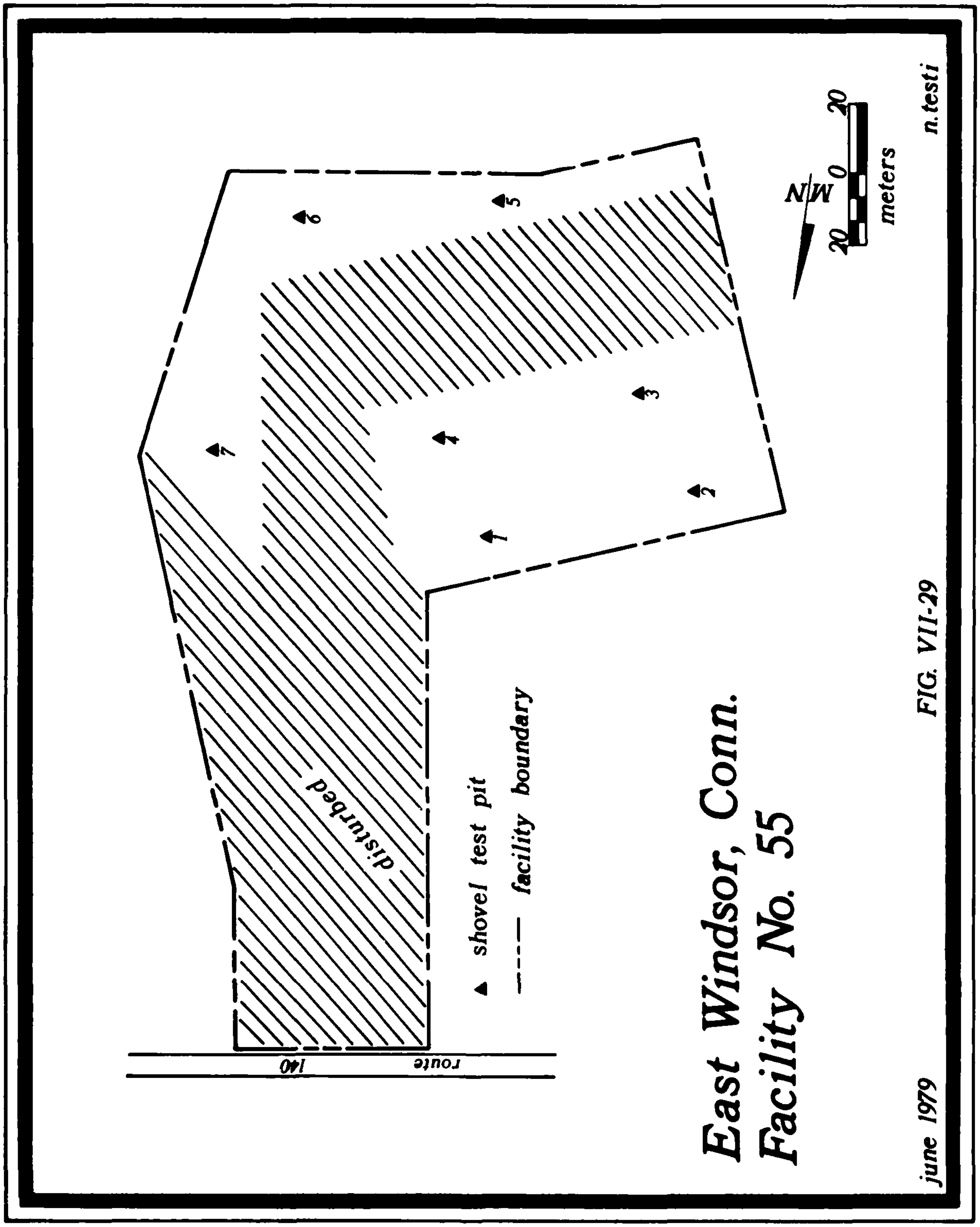
Plate 121: Facility 54, Family Housing, New Britain, Ct.

Facility Name: East Windsor
Facility Number: 55
Level of Investigation: Stage II
CDS: 7.0 ZES: 12.5
Disturbance Type: 1,2,3,4
Cultural Resources Sensitivity: High
Contact: Mr. Philip Lasher (203) 623-2670

This facility is an old Nike launcher and family housing area which is located on Phelps Road (Rt. 191), East Windsor, Connecticut. There are no known sites on or near the facility, but the area in general is highly sensitive in terms of prehistoric sites. The facility is situated on a bluff 1.5 kilometers east and 185 meters above the Connecticut River. Approximately 3,000 square meters appear to be superfically disturbed (Type 1) and was tested. This area was broken up into three small zones. Zone A, 2500 square meters, is located north of the launcher along the facility fence and was tested with four testpits. Zone B is a small strip of land south of the launcher. It is 500 square meters and two testpits were dug here. Zone C is a small area of about 200 square meters located along the eastern fence. One test pit was dug here. No cultural materials were found. The composite soil profile is fairly homogeneous.

0 - 15 cm. - Brown sandy humic zone, gravel.
15 - 60 cm. - Brown or orange reddish sand.
60 - 100 cm. - Tan and gray sand, some clay.

The possiblity of disturbance is high although the soil profile is inconclusive on this point. There is little natural vegetation on the facility. Outside the fence the vegetation is a mixed hardwood-conifer forest of birch, oak, maple, pine and hemlock. Based on the results of the Stage I and II investigation no further work was recommended.



East Windsor, Conn.
Facility No. 55

FIG. VII-29

Plate 122: Facility 55, Reserve Center, East Windsor, Ct. The old Nike launcher site, now a reserve center.

Plate 123. Facility 55, Family Housing, East Windsor, Ct.

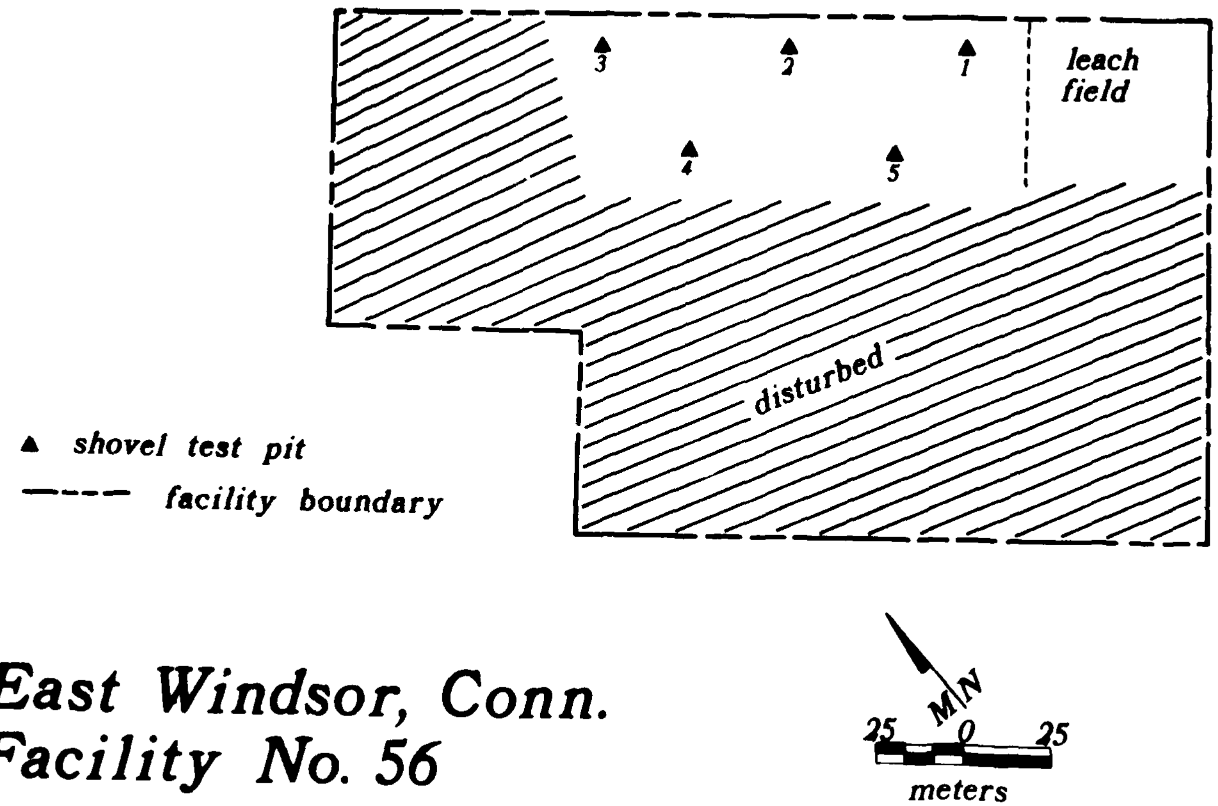
Facility Name: East Windsor
Facility Number: 56
Level of Investigation: Stage II
CDS: 11.0 ZES: 17.0
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. B. Corona (203) 623-9441

This facility is a Nike control site which was converted into a reserve center. The facility is located on Scantic Road, East Windsor, Connecticut. It is situated in a prehistoric archeologically sensitive zone on high ground overlooking both the flood plains of the Connecticut and Scantic rivers. Seven sites are located about 1.6 kilometers west of the facility on the flood plain of the Connecticut River. They are sites: 56-P001, 56-P002, 56-P003, 56-P004, 55-P005, 56-P006 and 56-P007. Prehistoric site 56-P035 is located 400 meters south on the floodplain of the Scantic River. Historic site FD-39 is also near the facility. The facility is almost entirely disturbed but possibly testable portions are located near the fence.

This testable area is a baseball field, approximately 3700 square meters in size. Five testpits were dug here but no cultural materials were discovered. The southern end of the ballfield has been filled to a depth of one meter to make it level. The composite soil profile is given below:

0 - 10 cm. - Brown sandy soil, very rocky.
10 - 50 cm. - Red brown clay and sand with lots of gravel.
50 - 100 cm. - Reddish brown sandy and gravelly clay.

These red clays do not appear to be of glacial origin. It is difficult to separate the filled area from the natural soil since the fill was procured locally. It is possible that the whole area is filled in. There are no trees on the facility but the surrounding vegetation is comprised of birch, oak and conifers. Based on the results of the Stage I and II investigation no further work was recommended.



East Windsor, Conn. Facility No. 56

june 1979

FIG. VII-30

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Plate 124. Facility 56, Reserve Center, East Windsor, Ct. The profile shows the built up helicopter pad. Note the concrete tower footings on the lower terrace. This area was the source of the fill for the helicopter pad.

Plate 125: Facility 56, Reserve Center, East Windsor, Ct. The cleared area in the foreground is the old helicopter pad. It is built up entirely of fill.

Facility Name: Portland
Facility Number: 57
Level of Investigation: Stage I
CDS: 14.0 ZES: 4.5
Disturbance Type: 1,4
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area which is located on Thompson Hill Road, Portland, Connecticut. The facility is located in a glaciated upland region 3.5 kilometers east of the Connecticut River. There are no known sites in the area. The facility is totally disturbed and no further work was required for the Portland facility.

Plate 126. Facility 57, Family Housing, Portland, Ct.

Facility Name: Cromwell
Facility Number: 58
Level of Investigation: Stage I
CDS: 13.0 ZES: 11.0
Disturbance Type: 1,2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a Nike control site which is now used as a reserve center and is located on West Street in Cromwell, Connecticut. Historic site FD-41 is located west of the facility, down the hill on the floodplain of a tributary of the Mattabesset River.

The area of this facility would have been a poor area for aboriginal occupations due to the location on a hill 75 meters above the surrounding terrain and thin soil deposition. The facility is totally disturbed which, along with the poor conditions, indicated that no further investigation was required.

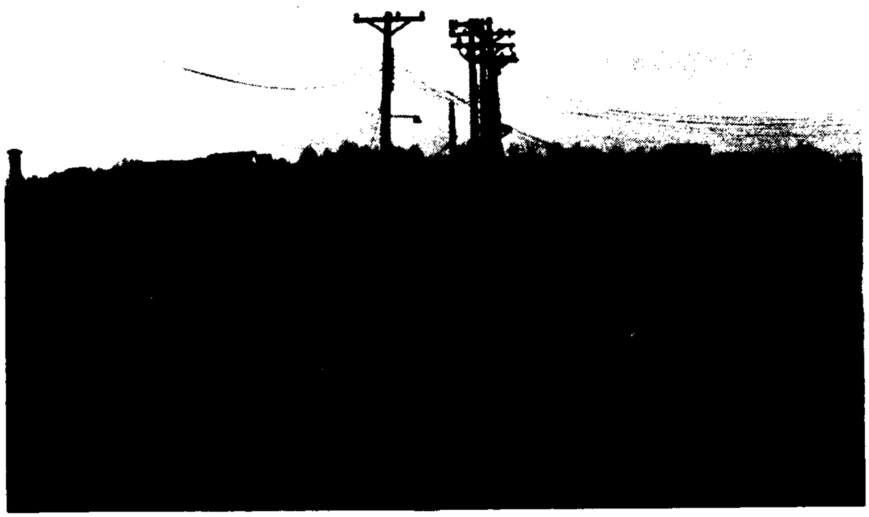

Plate 127. Facility 58, Reserve Center, Cromwell, Ct.

Facility Name: Plainville
Facility Number: 59
Level of Investigation: Stage I
CDS: 8.6 ZES: 12.5
Disturbance Type: 2
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area located on Farmington Avenue in Plainville, Connecticut. The facility is located on the poorly drained floodplain of the Pequabuck Creek. It is surrounded by Shade Swamp and Rattlesnake Mountain. The general area is plagued by poor drainage. There are no known sites in the area of the facility although the SHPO considers this area sensitive. The facility is total'· disturbed and no further testing was required.

Plate 128: Facility 59, Family Housing, Plainville, Ct.

Facility Name: Fairfield
Facility Number: 60
Level of Investigation: Stage I
CDS: 6.4 ZES: 15.0
Disturbance Type: 2,3,4
Cultural Resources Sensitivity: High
Contact: Mr. W.D. Bishop (203) 259-7819

This facility is a reserve center located at 180 High Street, Fairfield, Connecticut. Two historic sites, both 1890s truss bridges FD-42 and FD-43, are located about 400 meters from the facility. This facility contains about 7000 square meters of undisturbed area. Unfortunately this area is a bedrock outcrop with no soil deposition, making it untestable.

Facility Name: West Hartford
Facility Number: 61
Level of Investigation: Stage I
CDS: 8.4 ZES: 12.0
Disturbance Type: 2,3
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winter (617) 796-3293

This facility is a reserve center which is located on Quaker Lane South, West Hartford, Connecticut. No sites are located near the facility. The facility is paved and landscaped from fence to fence and no additional testing was required.

Plate 129: Facility 61, Reserve Center, West Hartford, Ct.

Facility Name: Middletown
Facility Number: 62
Level of Investigation: Stage I
CDS: 12.0 ZES: 9.0
Disturbance Type: 1,2
Cultural Resources Sensitivity: Low
Contact: Mr. R. Winters (617) 796-3293

This facility is a family housing area located on Westfield Street, Middletown, Connecticut. It is situated on Staddle Hill, overlooking wet areas both to the east and west. The Cogirchaug River is located two kilometers to the east. Two historic sites, FD-47 and FD-48, are located near the facility. The facility is totally disturbed and no additional work is required.

Plate 130: Facility 62, Family Housing, Middletown, Ct.

Facility Name: New Haven
Facility Number: 63
Level of Investigation: Stage II
CDS: 3.0 ZES: 19.5
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. Duda (203) 387-7557

This facility is a reserve center which is located at 200 Wintergreen Avenue, New Haven, Connecticut. It is situated on the floodplain of Wintergreen Brook, a tributary to the West River. The facility is sheltered from cold, northeasterly winds by West Rock Ridge. It would appear to be an excellent location, both historically and prehistorically. A prehistoric site, FD-63-1, is located nearby and the State Historic Preservation Office designated a prehistorically sensitive zone, located 800 meters west of the facility. The New Haven facility has a potential test area located near a creek inside the fence. This area appears to be undisturbed and approximately 2500 sq. meters were testable. Mr. Belamy, who is employed at the facility, said that no cultural materials were discovered during a recent sewer installation. The area was tested with six testpits, and no cultural material was found. The composite soil profile is given below.

0 - 30 cm. - Brown sand with cobbles and unsorted gravel.
30 - 100 cm. - Red brown sand with cobbles and gravel.

The unsorted gravel indicates glacial soils. The vegetation includes small oaks, maples and a relatively thick undergrowth of briars and poison ivy. The small size of the trees either means that the area has been cleared within the last 20 years or that edaphic conditions prevent maturation. Based on the results of the Stage I and II investigation no further work was recommended.

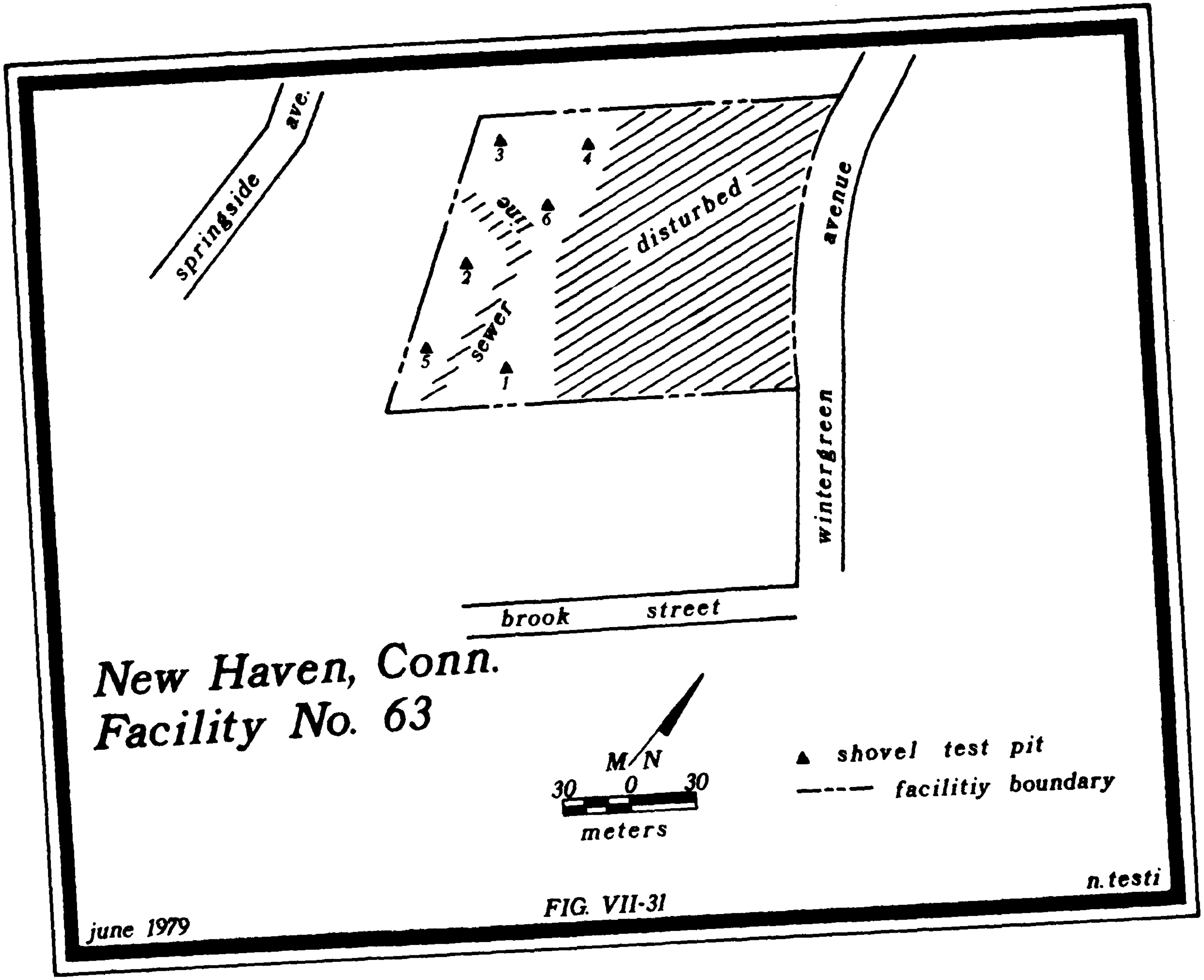
New Haven, Conn.
Facility No. 63
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FIG. VII-31

Plate 131: Facility 63, Reserve Center, New Haven, Ct. The area to be tested is out of the picture to the left.

Plate 132: Facility 63, Reserve Center, New Haven, Ct. Part of the undisturbed area in back of the reserve center. The stream runs through the woods to the right.

Facility Name: Waterbury
Facility Number: 64
Level of Investigation: Stage II
CDS: 12.4 ZES: 12.0
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: Low
Contact: CSM F.J. Pascarelli (203) 753-2334

This facility is a reserve center located on a steep, 30 meter bluff on Lydia Street, Waterbury, Connecticut. The soil here is thin and very rocky with bedrock outcrops. An historic site, FD-49, is located 800 meters south of the facility.

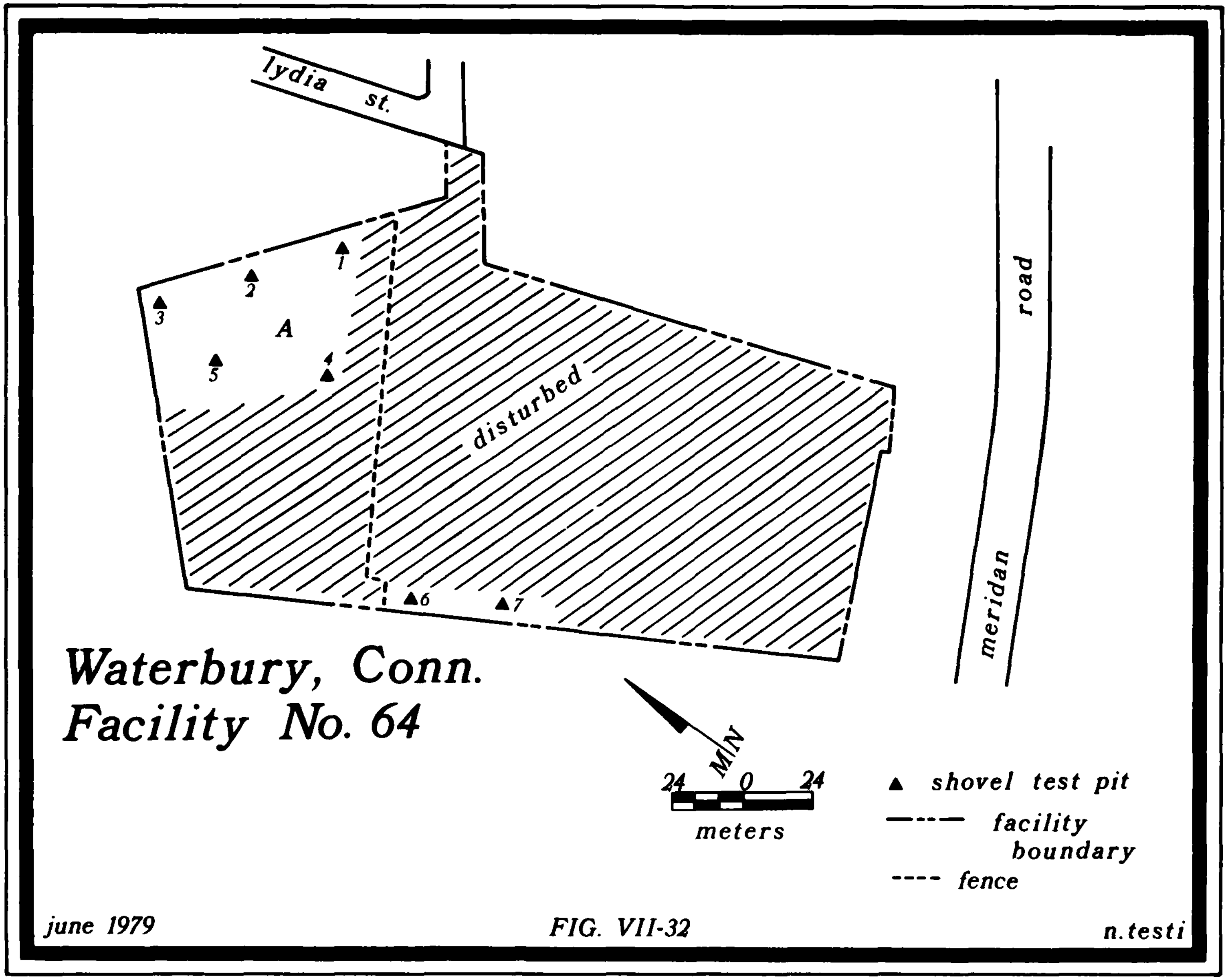
The Waterbury facility has 10,000 square meters of possibly undisturbed area outside the fence. A sample of 5100 sq. meters was tested. This facility is located in an area of low prehistoric sensitivity.

The area marked for testing was found to be disturbed. The surface has been stripped of soil as is evidenced by bedrock outcrops, bulldozer tracks and a thin and level soil covering. Several testpits were dug in two areas, the larger of which is outside the fence. No cultural materials were found. A composite soil profile is given below:

0 - 20 cm. - Dark gray and brown soil with gravel, some modern trash, pieces of broken concrete and bricks.

20 - 50 cm. - Brown clay with unsorted cobbles and gravel, highly compacted.

Most testpits were stopped by bedrock at 50 cm. Wires, bricks and modern trash were found in the top 20 cm. The surrounding vegetation is brush, some maples, shrub oak and scattered conifers. Boulders of broken up bedrock are also scattered over the test area. Based on the results of the Stage I and II investigation no further work was recommended.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Waterbury, Conn.
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FIG. VII-32

Plate 133: Facility 64, Reserve Center, Waterbury, Ct. The test area on the bluff outside the facility. The bluff drops off in the middle distance. The wooded hill in the right center is across the Connecticut River and the city of Waterbury.

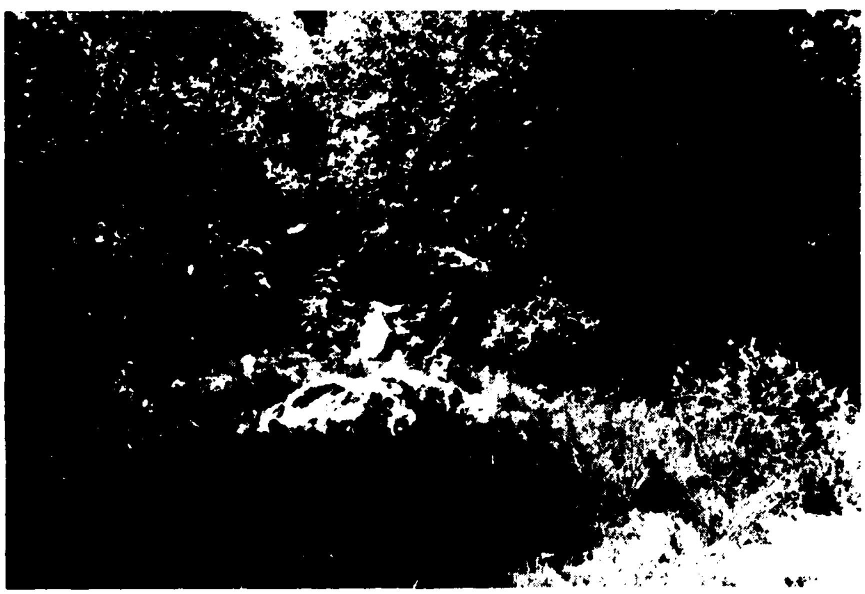


Plate 134: Facility 64, Reserve Center, Waterbury, Ct. Another view of the test area. Note the large boulders scattered about.

Facility Name: Auburn
Facility Number: 65
Level of Investigation: Stage I
CDS: 13.0 ZES: 11.0
Disturbance Type: 2,3
Cultural Resources Sensitivity: High
Contact: Mr. D. Best (207) 782-7737

This facility is a reserve center located at 1072 Minot Avenue, Auburn, Maine. Four historic sites, FD-50, FD-51, FD-52, and FD-53, are located to the east of the facility. The facility is located on acidic soils on glaciated terrain 2.4 kilometers west at the Androscoggin River. The facility is paved from fence to fence and no further investigation was required here.

Plate 135: Facility 65, Reserve Center, Auburn, Me.

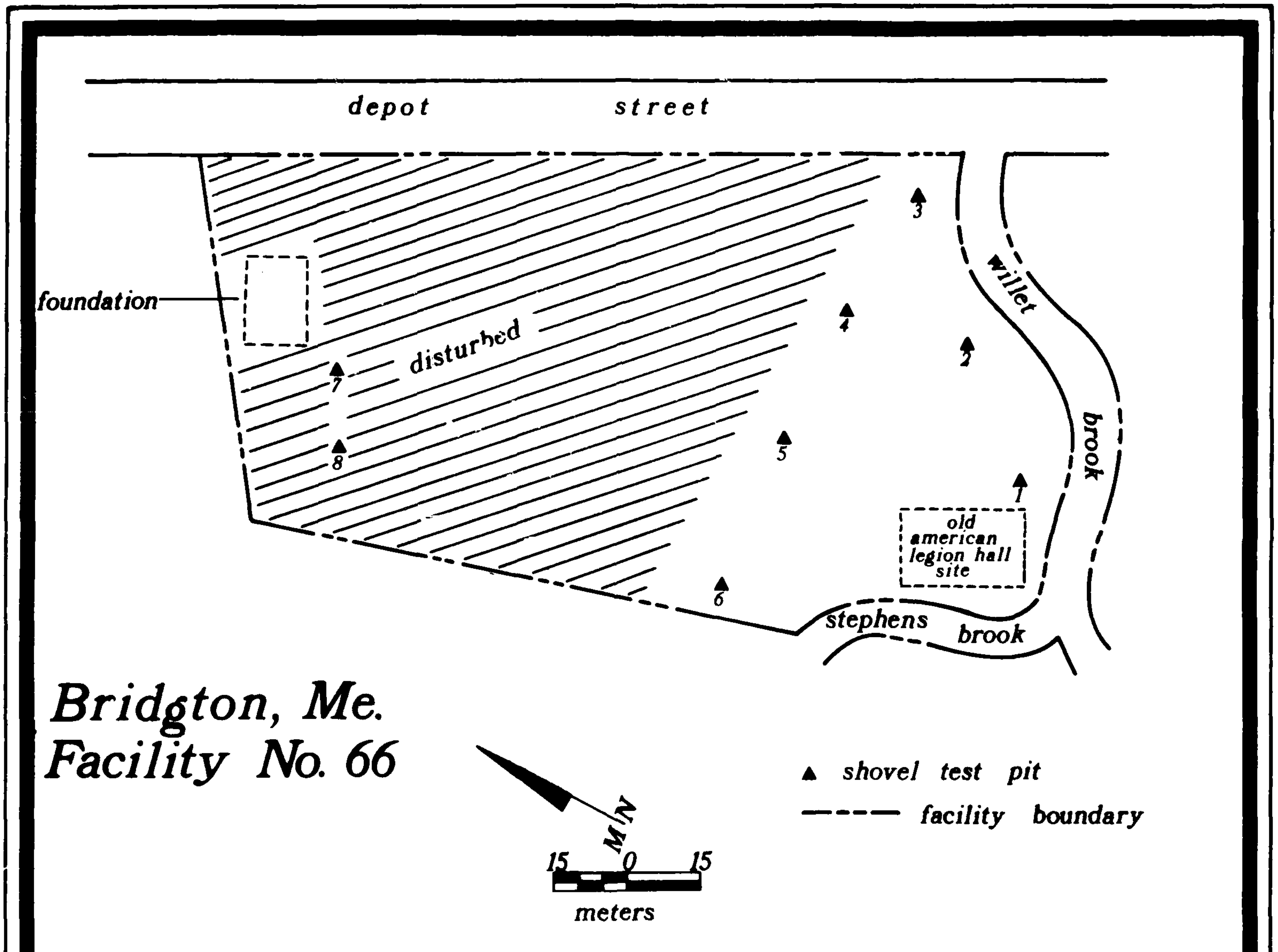
Facility Name: Bridgton
Facility Number: 66
Level of Investigation: Stage II
CDS: 6.0 ZES: 12.0
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. Ladakakos (?07) 647-2071

This reserve center is located at 15 Depot Street, Bridgton, Maine. It is situated between Long Lake and Highland Lake in an area which would make an excellent portage route between these two lakes. Historic Site FD-54, the Perry House, is located a short distance northeast of the facility. There is a foundation at Bridgton, the remains of the Keene Machine Shop, built in 1927 and torn down when this property was acquired by the military. Eight testpits were used to examine the approximately 5500 square meters of possibly undisturbed area. The remains of the American Legion Hall, completely razed when the reserve center was built, were also found in this area. It appears that the whole facility is at least superficially disturbed. The composite soil profile is shown below:

0 - 40 cm. - Brown sandy soil with lots of cobbles, gravel, crushed brick, 20th century machine-made round nails and glass.

40 - 90 cm. - Highly compacted gravelly brown sand.

Some testpits were closed after 70 to 90 centimeters due to extreme compaction and bedrock fragments. This soil seems to have developed locally. A mixed deciduous-coniferous forest with thick briars and undergrowth covers the area. Only isolated maples are left on the facility. Based on the results of the Stage I and II investigation no further work was recommended.



june 1979 FIG. VII-33 n. testi

Plate 136: Facility 66, Reserve Center, Bridgton, Me. View from the site of the completely razed American Legion hall towards the front of the reserve center. The area shown was tested.

Plate 137: Facility 66, Reserve Center, Bridgton, Me. View from the same spot as Plate 136 above except facing west. The machine shop foundation is located at the very right of the plate. Some of the area in the foreground was tested.

Plate 138: Facility 66, Reserve Center, Bridgton, Me. Part of the Keene Machine Shop ruin.

Facility Name: Bangor
Facility Number: 67
Level of Investigation: Stage I
CDS: 130 ZES: 12.5
Disturbance Type: 2,3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

The reserve center is located on Union Street, Bangor, Maine. The Penobscot River is 2.5 kilometers to the southeast. There is no indication of any sites in the area and the facility is totally disturbed, therefore no further work was required.

Facility Name: Dexter
Facility Number: 68
Level of Investigation: Stage I
CDS: 12.0 ZES: 8.0
Disturbance Type: 0,1,2,3
Cultural Resources Sensitivity: High
Contact: Mr. R. Winters (617) 796-3293

This facility is a reserve center located in Dexter, Maine. One historic site is located in the Town of Dexter, FD-55. The Maine State Historic Preservation Office feels the Dexter area is prehistorically sensitive.

This facility was totally disturbed either by construction or paving. No test pits were dug here for that reason. The surrounding vegetation is a mixed conifer and birch forest with white pine being the most common tree. There are no trees on the facility itself. The facility is located in a small-town residential neighborhood.

Plate 139: Facility 68, Reserve Center, Dexter, Me. This area could not be tested.

Plate 140: Facility 68, Reserve Center, Dexter, Me. The other side of the facility. Note the filled and raised parking lot sloping down to the original surface at the fence.

Facility Name: Saco
Facility Number: 69
Level of Investigation: Stage I
CDS: 2.6 ZES: 18.0
Disturbance Type: 2,3
Cultural Resources Sensitivity: Low
Contact: Mr. J. Donahue (207) 284-4822

This facility is a reserve center which is located at 101 Franklin Street, Saco, Maine. The facility is located two kilometers northeast of the Saco River in an area of poor drainage. There is no indication of any sites in the area of the facility. The facility is totally disturbed and no futher work is required.

Plate 141: Facility 69. Reserve Center, Saco, Maine.

CHAPTER 7

ANALYSIS

The analysis concerns itself primarily with the preliminary testing of the two models. The test for each model consists of a rank order correlation between the relative sensitivity measure for each zone (ZES) or locus (CDS), and the number of sites in that zone or near that locus. The higher the correlation, then we may assume the better the model works. In addition a discriminant analysis as well as a Kruskal- Wallace analysis of variance were also performed.

The Zonal Model

This model was designed to give a generalized measure of environmental variability and desireability in the 1.6 kilometer radius circle around each facility. Due to its general nature some of the diversity at specific loci was masked, a problem which led to the development of the locus- specific model.

For the zone around each facility, an area of approximately 8.2 square kilometers, the ZES was computed using the method and variables discussed in Chapter 5. It was predicted that those zones with the highest ZES would also have the highest probability for containing prehistoric sites. The number of sites within each zone were summed up and the two variables, ZES and number of sites were submitted to a rank order correlation analysis. Due to the large number of ties in the data set Kendall's tau was chosen as the best measure of correlation between the two variables. The value of Kendall's tau is + 0.465 with a significance level of 0.001. This value suggests a significant correlation. The significance level is no reflection of the strength of the correlation, it is instead a measure of the probability that the results are not based on random factors. However, we may assume that each zone's ZES gives some indication as to its prehistoric resource potential. We may also conclude that there is a positive relationship between the ZES for a zone and the number of sites in it. Reasons for a certain amount of ambiguity in the conclusion include the lack of a random sample (the sample was biased with respect to the specific project requirements) and the fact that the environmental variables are not really independent (for example, soil type affects drainage). A different approach is to view each zone around a facility as belonging to one of two groups. The first group contains zones in which sites are found while the second contains zones in which no sites were found. A t-test between the two groups, using their ZES as data, will reveal if the distribution of the scores between groups are significantly different.

The resultant t-statistic and significance measure are:

$t = 6.17 \quad sig = .0001 \quad DF = 40$

Due to the ordinal nature of the data the Kruskal-Wallace One-Way Analysis of Variance was also performed. The statistic computed during Kruskal-Wallace One Way Analysis is H, which distributes similarly to a Chi square with K-1 degrees of freedom where K is the number of groups. If H is significant, which it is in this case, then the two groups are different.

H = 25.866 with 1 degree of freedom

Sig= .001

Both of these tests show a large and non-random difference in ZES between the two groups of zones.

The Locus-Specific Model

The predicted sensitivities for the facilities are represented by the Cumulative Distance Score (CDS), which is the sum of the distances between each of the environmental variables for a facility and the median for each of the variables for all sites in the project area. The higher the cumulative distance, the less a facility's location agrees with the optimum site location. The optimum site location is described by the median for each variable for all known sites.

If a facility is located in an advantageous position in terms of the variables measured, it will have a low CDS. The number of sites that are located near a facility was correlated with the CDS of each facility. If the model predicted correctly then a high negative correlation is expected. The Kendall's tau was -0.423 with a significance of .001. As was the case with the zonal model, this attests a moderate but significant correlation.

In order to determine which of the six variables on which the locus-specific model is based were the most important for predicting cultural resource sensitivity, measurements were made by correlating facility scores on these variables with the number of sites near a facility. The variables are listed below in order of their predictive power.

Variable	Kendall's tau	Significance
Forest type	+0.401	0.001
Land form	+0.305	0.001
Distance to water	+0.283	0.003
Absolute elevation	+0.165	0.063
Elevation above water	+0.110	0.138
Soil type	+0.018	0.154

Although it appears that soil type and elevation measure appear to be relatively poor predictors, more refined measurements are probably needed before they should be removed from the analysis and relegated to positions of unimportance. For instance, forest type and soil type, since the former is in part a function of the latter, should be ranked together yet they represent the most and least powerful environmental variable.

The great disparity between soil and forest type suggests that care should be used in interpreting the statistical results. This may indicate some as yet undetermined problem in the method or choice of variable. Since this model is designed to indicate only general association, the statistical results at best reflect only general trends which should lead to further refinement and verification of the model.

Based on the distribution of the cumulative distance score three levels of sensitivity were derived. A CDS of 3.0 or less designates a highly sensitive locus. A CDS between 3.1 and 8.0 designates a medium sensitivity locus and a CDS above 8.0 designates a low sensitivity locus.

Only five facilities, areas I1 and K at Fort Devens, and facilities 10, 17 and 63, were placed into the high sensitivity group. All these areas were highly disturbed. Forty-one facilities were placed in the medium category and 33 in the low sensitivity category.

In order to determine how well these three groups of facilities were separated, and on which variable that separation was based, a discriminant analysis was performed. Group membership was based on CDS values. Group 1 contains all facilities of high cultural resource sensitivity (CDS values 3.0 and below), Group 2 contains all facilities of medium cultural resource sensitivity (CDS from 3.1 to 8.0) and Group 3 contains all the low sensitivity facilities (CDS above 8.0).

The F matrix shows significant differences between all groups.

	GROUP	
	1	2
2	F = 6.7 Sig. = .001	
3	F = 29.3 Sig. = .001	F = 45.0 Sig. = .001

Table 16. F Matrix of Group Difference

The best discriminating variables are given below, with the best discriminators listed first.

Distance to water
Landform
Absolute elevation
Soil type
Elevation above water
Forest type

Since all of the variables were entered into the analysis, they each quantify differences between groups. The variables are ranked in order of their general capacity to describe site locations and we may assume that they are important in making site locational decisions. However, it should again be stressed that these results must be interpreted with caution because the associations that have been generated by this analysis are only general in nature. Additionally, the lack of independence between certain variables should also be taken into consideration when interpreting the results.

Conclusion.

We have shown with slight to moderate assurance that both the locus-specific and zonal models were verified, although further refinement in variable descriptions is probably needed. The Kendall's tau values computed during the test of the models indicate only a moderately positive correlation between the derived sensitivity measures and the number of sites. The zonal model did not fail to identify any zone with sites at them but it did put some zones with no site into the medium and high sensitivity groups. If the model is going to make wrong predictions then it is better that sensitivity ratios are skewed positively, as is the case here, than that zones of medium or high sensitivity be classed into the low sensitivity group.

The locus-specific model generated similar results. The correlation between CDS and number of sites is only moderate. The ratings of facilities are also skewed to the positive side. Both models provide general support for the environmental variables chosen although refinement in coding and a better sample would probably increase the effectiveness of the models.

CHAPTER 8

CONCLUSION

The only prehistoric cultural material recovered during the entire survey was an unmodified flake found of the surface of a driveway in Hingham. Historic materials were limited to occasional small scatters of undiagnostic ceramics and three foundation segments at Ft. Devens. Although this lack of material is disappointing from an archaeological perspective, it should come as no surprise when considering the great amount of disturbed area encountered. We are confident that the survey has not failed to discover any culturally significant materials.

Cultural Resource Management

No further work is required at any facility except Fort Nathaniel Greene (Facility 35). No sub-surface testing was performed at Fort Greene because of the possibility for buried unexploded ordinance. Once a decontamination certificate has been found or re-issued, a program of sub-surface testing should be developed which will sample those parts of Fort Greene which are not flooded or swampy. Although the drainage is poor in this area of Point Judith and there appears to be little possibility of inland sites, there is evidence of prehistoric occupation to the north and east, and *further testing is definitely recommended.*

The many frame and clapboard buildings constructed on Ft. Devens during World War II represent a traditional style of military architecture from this period. Although at present these types of buildings are common on many military installations, including Ft. Devens, they might become scarce as they are replaced with newer, more modern structures.

One of the criteria of cultural resource sensitivity is age in excess of 50 years. Since many of these buildings were built in the period 1935 to 1945, they will soon be eligible for consideration as significant cultural resources. Although age is not the only and sufficient criterion for such a determination it should be kept in mind that within a few years these buildings will be seen in a new light.

Summary

Two predictive models, one zonal and the other locus-specific, were constructed and tested, both models were based on the presence of what were considered to be desirable environmental attributes. Both models were verified at moderate levels, with significance levels of better than .001. The models are able to predict the cultural resource sensitivity of a zone, in terms of prehistoric resources, or a specific locus with some accuracy, although the value of the correlation coefficients

suggests that the models are guides and approximations. The limited accuracy of the predictions made by these models is due to the fact that the predictions are skewed towards the conservative side. (See previous chapter). The usual errors were that zones or loci with predicted high sensitivities may not contain sites. In no instance had an area which turned out to contain sites ever been classified as a low sensitivity area.

The general lack of any kind of cultural materials found during the investigation can be attributed to the fact that most of the areas tested were disturbed. The facility evaluations conducted during Stage I were very conservative, especially in terms of the amount and nature of disturbance. In many instances suspicions of disturbance were not confirmed until sub-surface testing had begun. Despite the lack of materials recovered we feel that the survey as a whole served two purposes: a diverse part of New England was surveyed, and two moderately accurate models of site locations were tested. If the results of these models are interpreted in a general context and with some caution, then the information that they provide on prehistoric site locational decisions and areas of prehistoric sensitivity can further our understanding of New England prehistory in the future.

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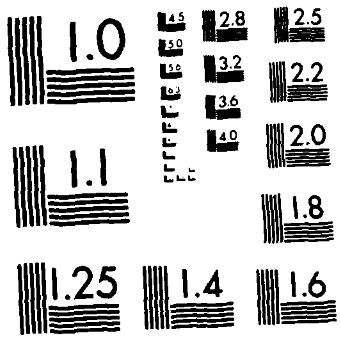

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APPENDIX I

Listing of Facilities

Facility 1, Fort Devens, Massachusetts. An active military base and training facility, established in 1917.

Facility 2, South Boston Support Activity, Boston, MA. Two facilities: one a former Army supply base acquired in 1917; the other a former Naval District Headquarters acquired in 1941. Houses various Department of Defense activities.

Facility 3, Burlington, Massachusetts. This is a family housing area which once served a Nike battery, acquired in 1955.

Facility 4, Nahant, Massachusetts. A family housing area which at one time served a Nike battery, acquired in 1956.

Facility 5, Wakefield, Massachusetts. A family housing area which at one time served a Nike battery, acquired in 1954.

Facility 6, Danvers, Massachusetts. A Nike Fire Control center converted into a Reserve Center, Acquired in 1955.

Facility 7, Beverly, Massachusetts. A family housing area which served the Nike battery at facility 6, acquired in 1955.

Facility 8, Hull, Massachusetts. A family housing area which served a Nike battery, acquired in 1955.

Facility 9, Quincy, Massachusetts. A Nike Fire Control area which has been returned to local control, acquired in 1952.

Facility 10, Randolph, Massachusetts. A family housing area for a Nike battery, acquired in 1955.

Facility 11, Bedford, Massachusetts. A family housing area for a Nike battery, acquired in 1955.

Facility 12, Taunton, Massachusetts. A Reserve Center acquired in 1956.

Facility 13, Cranston, Rhode Island. A Reserve Center.

Facility 14, Swansea, Massachusetts. A family housing area, acquired in 1955.

Facility 15, Hingham, Massachusetts. Acquired in 1942 as a Naval ammunition storage facility. Acquired from the Navy, converted into a Reserve Center and a medical warehouse. About four sq. kilometers were turned over to Massachusetts and is now the Wampatuck State Park.

Facility 16, New Bedford, Massachusetts. Originally a coastal fortification acquired in 1860. This parcel has been sold. During the 1950's a reserve center was built on the northwest corner of the property. The name of the reserve center is the New Bedford Reserve Center. Fort Rodman proper has been returned to local control and is a historic park.

Facility 17, Attleboro, Massachusetts. A Reserve Center acquired in 1956.

Facility 18, Brockton 1, Massachusetts. A Reserve Center acquired in 1964.

Facility 19, Granby, Massachusetts. A reserve weekend training site acquired in 1932 by the Air Force and transferred to the Army in 1975. Most of the original area was returned to local control in 1973.

Facility 20, Brockton 2, Massachusetts. A Reserve Center, acquired in 1973.

Facility 22, Pittsfield, Massachusetts. A Reserve Center, acquired in 1956.

Facility 23, Roslindale, Massachusetts. A Reserve Center, acquired in 1956.

Facility 24, Springfield, Massachusetts. A Reserve Center, acquired in 1953.

Facility 25, Topsfield, Massachusetts, an unused Nike Launcher site and the family housing area which served it. Acquired in 1955.

Facility 27, Worcester, Massachusetts. A Reserve Center, acquired in 1953.

Facility 28, Grenier Field, Manchester, New Hamphsire. A Reserve Center.

Facility 29, Manchester, New Hampshire. A Reserve Center, acquired in 1955.

Facility 30, Portsmouth, New Hampshire. A Reserve Center, acquired in 1956.

Facility 31, Rochester, New Hampshire. A Reserve Center, acquired in 1956.

Facility 33, Lincoln, Rhode Island. A maintenance depot and workshop, acquired in 1957.

Facility 34, Bristol, Rhode Island. A Reserve Center, acquired in 1956.

Facility 35, Ft. Nathaniel Greene. Originally acquired in 1942 as a Coastal Artillery Battery. The battery was deactivated and most of the property turned into a state park. The remnant is now used as a reserve center.

Facility 36, Providence, Rhode Island. A Reserve Center, acquired in 1951.

Facility 37, Warwick, Rhode Island. A Reserve Center, acquired in 1959.

Facility 38, North Smithfield, Rhode Island. A family housing area acquired in 1955. This facility is located next to an Air National Guard facility but is not associated with it.

Facility 40, Montpelier, Vermont. A Reserve Center, acquired in 1956.

Facility 41, Rutland, Vermont. A Reserve Center, acquired in 1956.

Facility 42, Winooski, Vermont. A Reserve Center, acquired in 1971.

Facility 43, Chester, Vermont. A Reserve Center, acquired in 1960.

Facility 44, Middletown, Connecticut. A Nike Launcher converted into a Rerserve Center. Acquired in 1955.

Facility 45, Milford, Connecticut. A family housing area, acquired in 1957.

Facility 46, Manchester, Connecticut. A family housing area, acquired in 1955.

Facility 47, Ansonia, Connecticut. A Nike Fire Control site converted into a Reserve Center, acquired in 1956.

Facility 48, Ansonia, Connecticut. A Nike Launcher site, converted into a Reserve Center, acquired in 1956.

Facility 32, Davisville, Rhode Island. This has been Navy property since 1944. A small family housing area was transferred to the Army in 1977.

Facility 49, Orange, Connecticut. A family housing area for facilities 47 and 48. Acquired in 1955.

Facility 50, Milford, Connecticut. Family housing associated with a defunct Nike Battery. Acquired in 1957.

Facility 51, Fairfield, Connecticut. Family housing associated with a defunct Nike Battery. Acquired in 1955.

Facility 52, Westport, Connecticut. Family housing associated with a defunct Nike Battery. Acquired in 1958.

Facility 53, Shelton, Connecticut. A former Nike Fire Control and a family housing area. Acquired in 1956. The fire control site has been sold.

Facility 54, New Britain, Connecticut. Family housing associated with a defunct Nike site. Acquired in 1959.

Facility 55, East Windsor, Connecticut. An old Nike launcher converted into a Reserve Center. Acquired in 1955.

Facility 56, East Windsor, Connecticut. The Nike Fire Control Center and housing area associated with facility 55, fire control site, now converted into a Reserve Center. Acquired in 1965.

Facility 57, Portland, Connecticut. A family housing area, acquired in 1955.

Facility 58, Cromwell, Connecticut. A Nike Fire Control Center, associated with facility 44, now a Reserve Center, acquired in 1955.

Facility 59, Plainville, Connecticut. A family housing area, acquired in 1955.

Facility 60, Fairfield, Connecticut. A Reserve Center, acquired in 1955.

Facility 61, West Hartford, Connecticut. Reserve Center, acquired in 1954.

Facility 62, Middletown, Connecticut. Family housing associated with facilities 44 and 58. Acquired in 1955.

Facility 63, New Haven, Connecticut. A Reserve Center, acquired in 1953.

Facility 64, Waterbury, Connecticut. A Reserve Center, acquired in 1957.

Facility 65, Auburn, Maine. A Reserve Center acquired in 1961.

Facility 66, Bridgton, Maine. A Reserve Center, acquired in 1956.

Facility 67, Bangor, Maine. A Reserve Center, acquired in 1956.

Facility 68, Dexter, Maine. A Reserve Center, acquired in 1957.

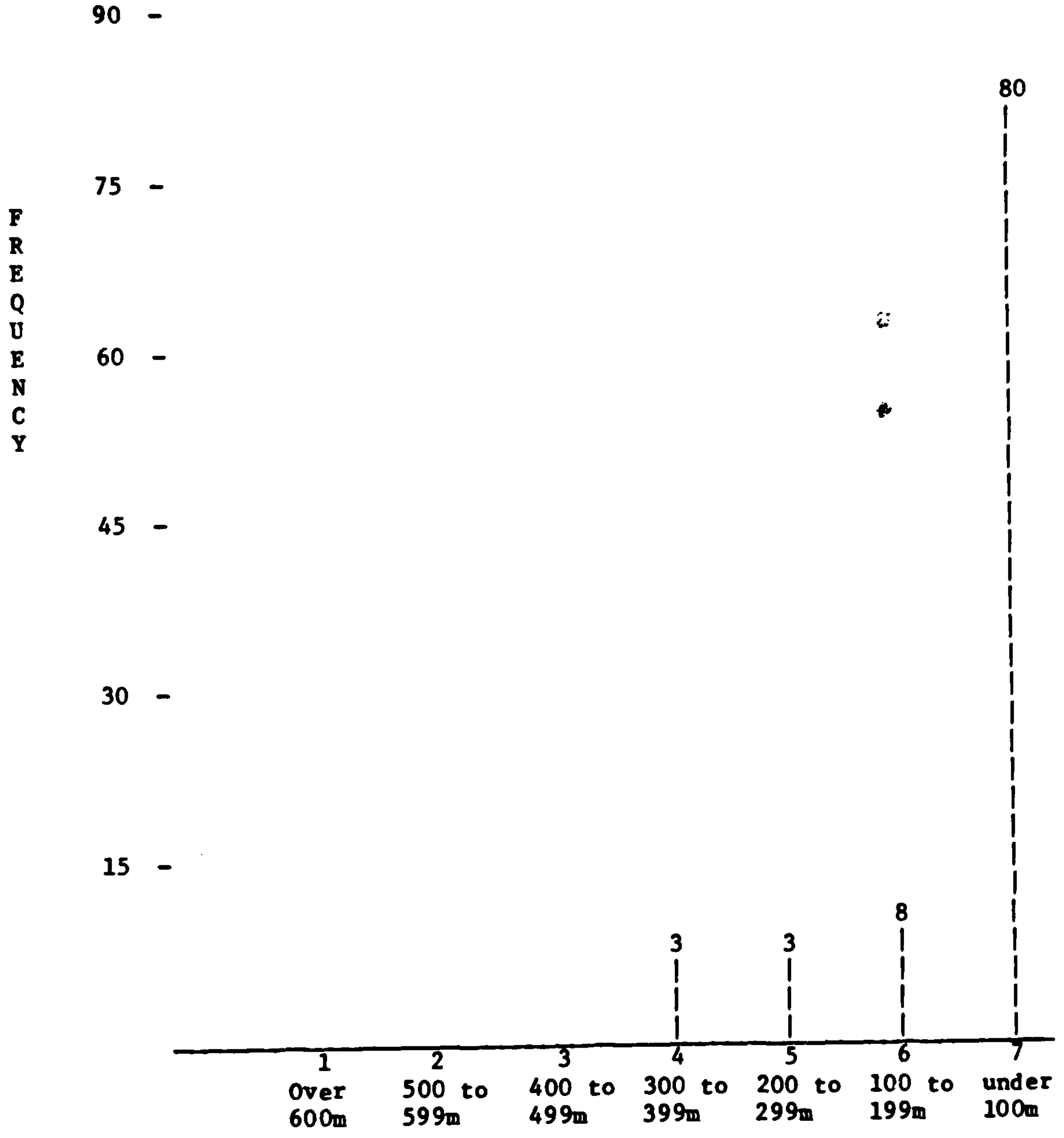
Facility 69, Saco, Maine. A Reserve Center, acquired in 1956.

APPENDIX II

Raw Data and Histograms

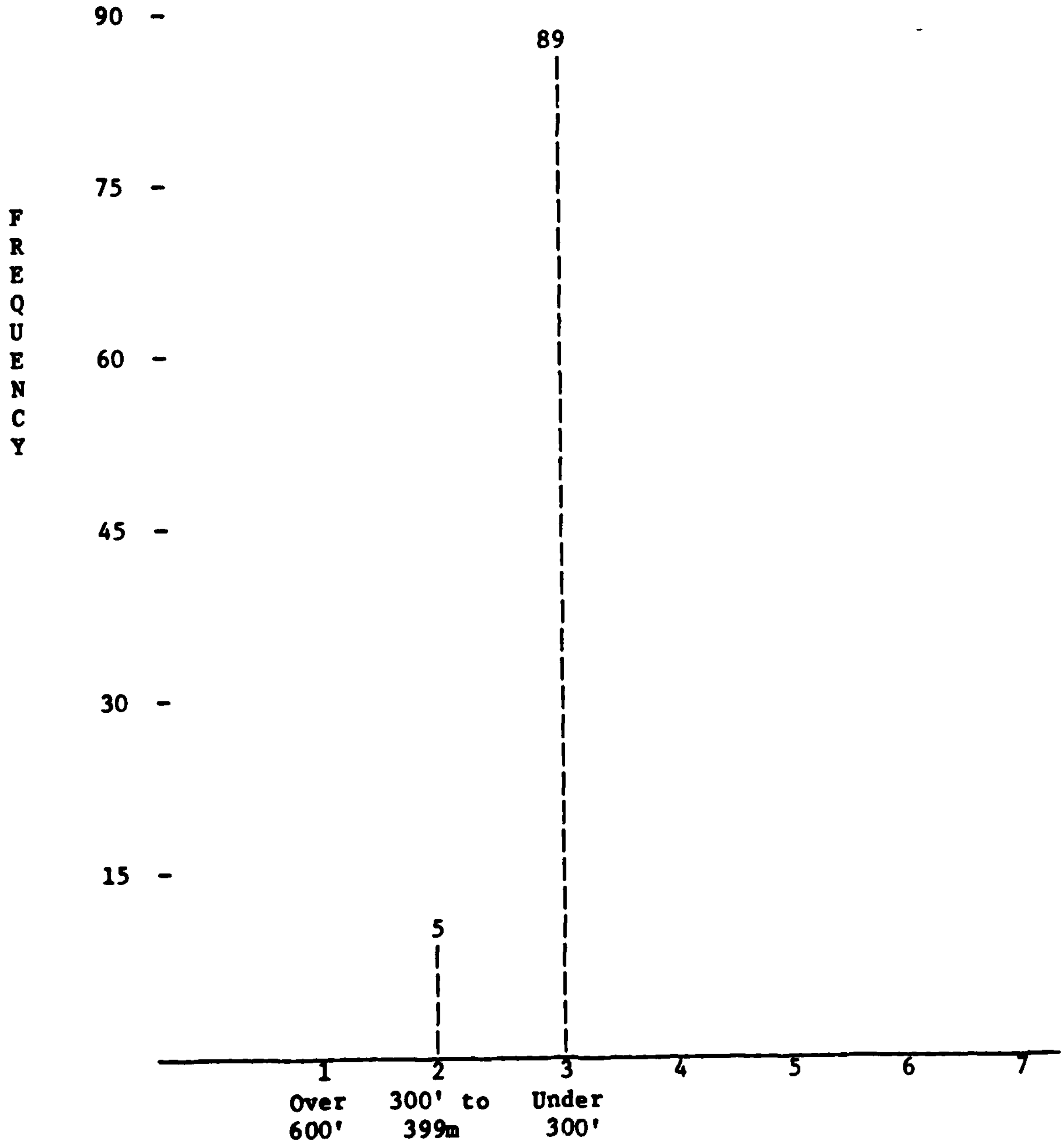
for Chapter 7

VARIABLE: DISTANCE TO WATER



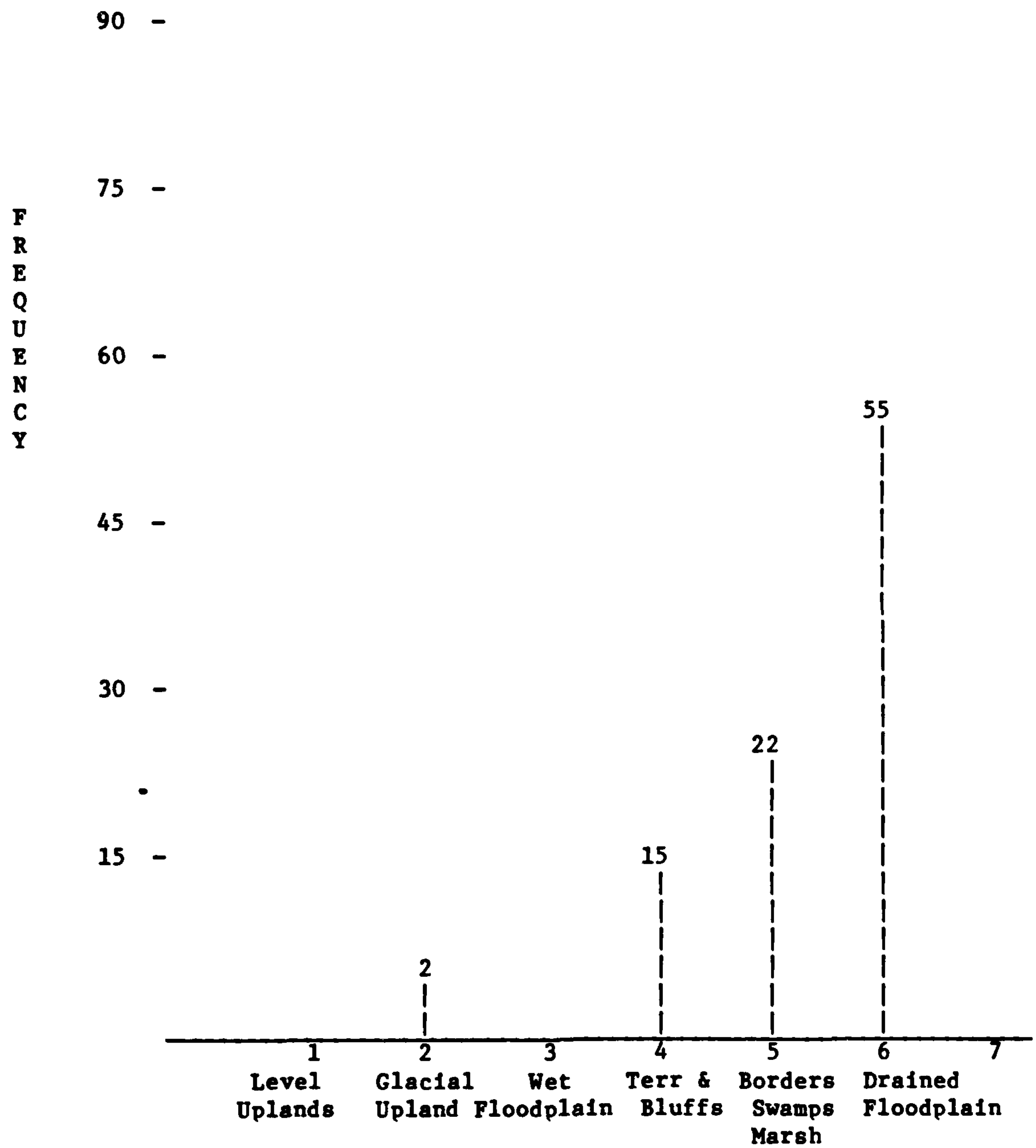
MEAN: 6.8 MEDIAN: 7 MODE: 7

VARIABLE: ABSOLUTE ELEVATION



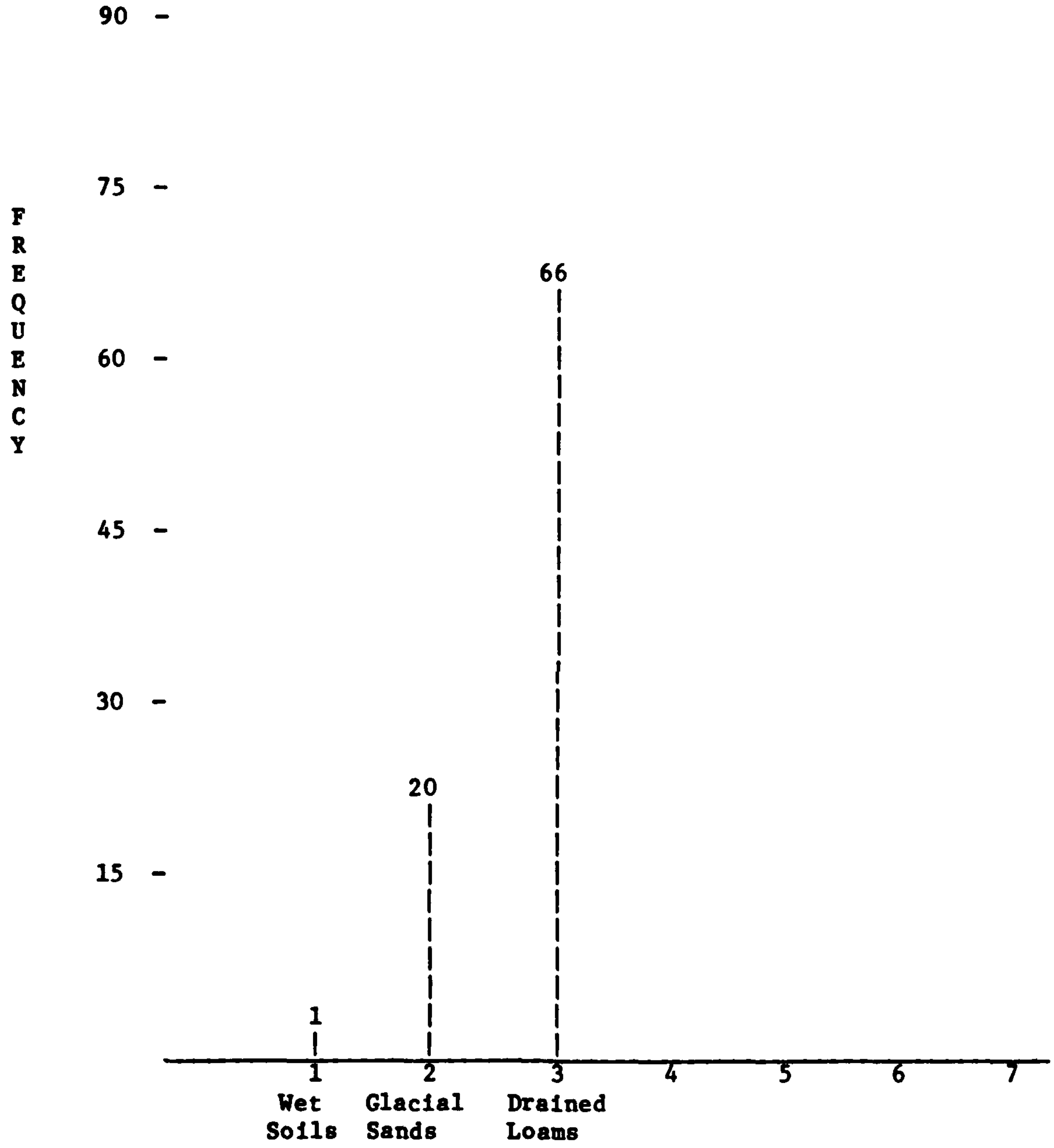
MEAN: 2.9 MEDIAN: 3 MODE: 3

VARIABLE: LANDFORM



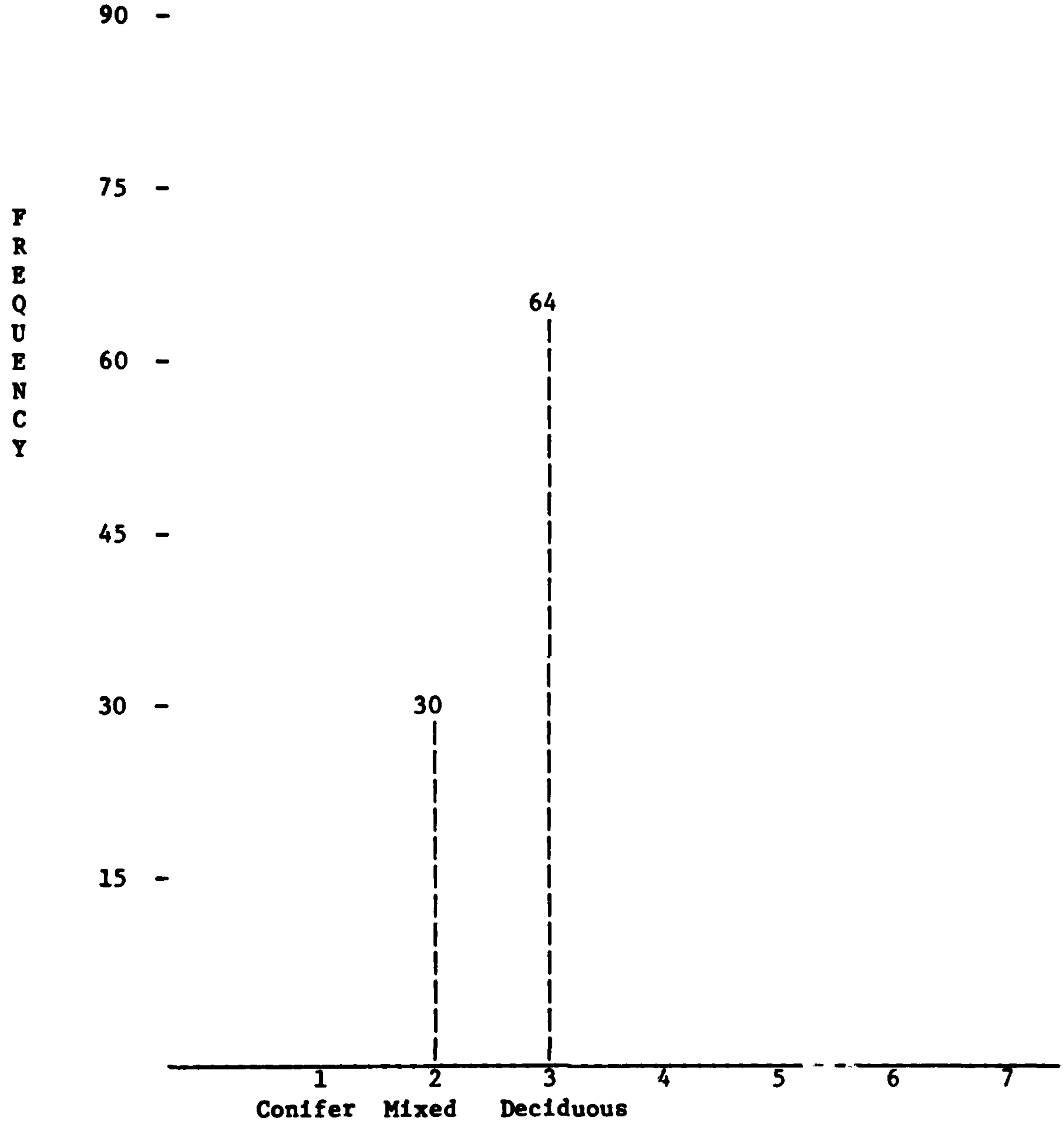
MEAN: 5.4 MEDIAN: 5.7 MODE: 6

VARIABLE: SOIL TYPE



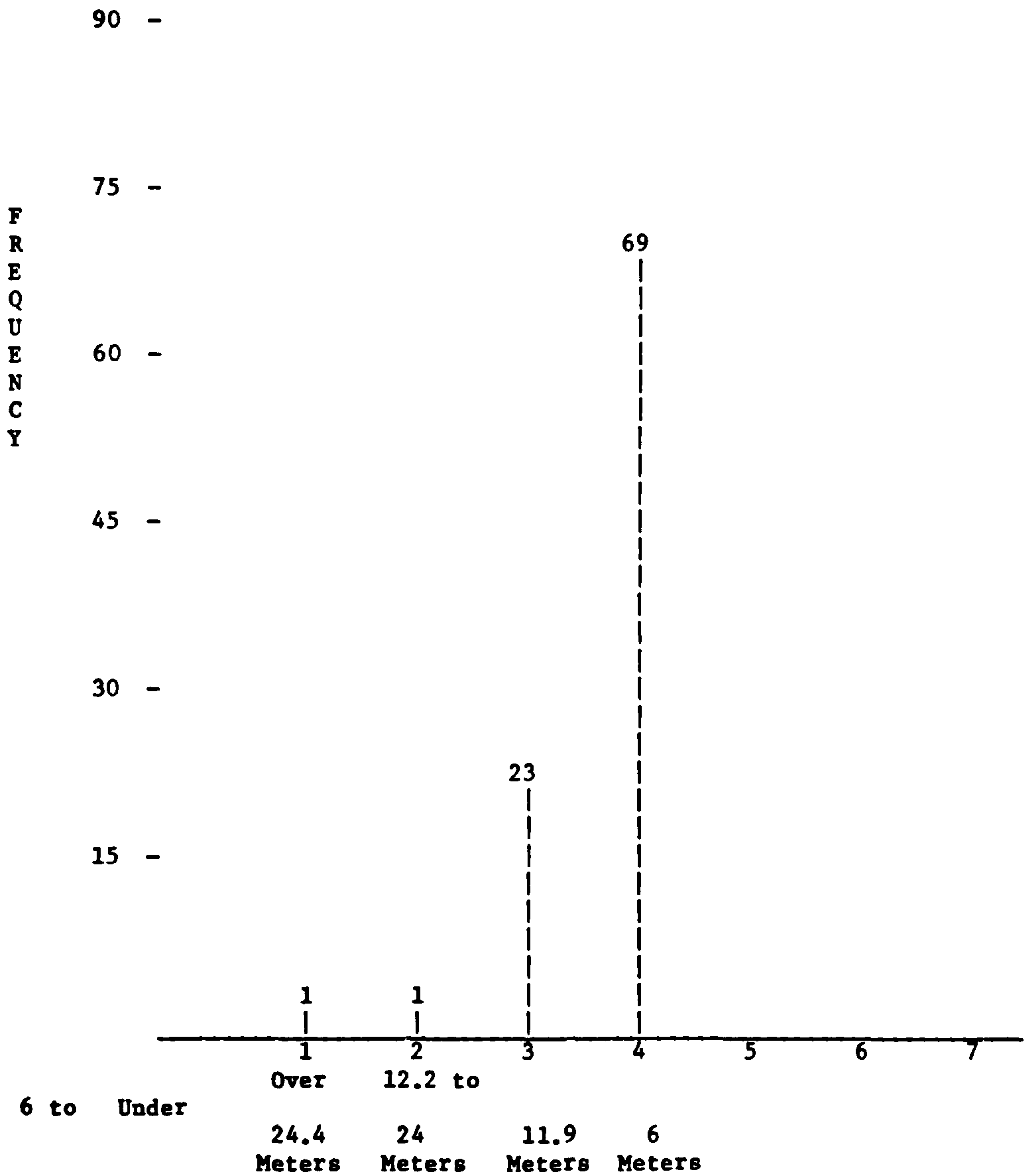
MEAN: 2.7 MEDIAN: 2.8 MODE: 3

VARIABLE: FOREST TYPE



MEAN: 2.7 MEDIAN: 2.8 MODE: 3

VARIABLE: ELEVATION ABOVE WATER



MEAN: 3.7 MEDIAN: 3.8 MODE: 4

Facility CDS and number of sites. This represents the raw data for the test of the locus-specific model in Chapter 7.

Facility C.D.S.	Number of Sites	Facility C.D.S.	Number of Sites
06.4	0	04.8	1
13.0	0	13.0	0
06.4	0	12.0	0
05.0	0	06.4	0
08.4	0	15.0	0
03.6	0	05.2	1
08.0	0	14.0	0
05.6	0	07.4	1
02.7	1	04.8	1
12.0	0	10.8	0
04.6	0	05.0	1
03.0	1	05.0	0
12.0	0	05.0	0
13.4	0	22.0	0
0.60	0	10.0	0
18.4	1	06.0	0
10.4	0	09.0	0
04.4	2	10.4	0
02.8	3	12.4	0
04.0	1	13.0	0
12.8	0	09.0	0
09.0	0	08.0	0
07.4	0	10.4	0
06.4	0	06.4	0
06.4	0	11.8	0
06.4	0	14.0	0
06.4	0	09.8	0
05.4	0	07.0	0
03.0	10	11.0	2
10.4	0	14.0	0
07.8	1	13.0	0
07.4	1	08.6	0
06.8	2	06.4	1
10.8	0	08.4	0
06.0	4	12.0	0
12.0	0	03.0	1
13.0	0	12.4	0
12.0	0	13.0	0
07.6	0	06.0	0

Facility ZES and number of sites. This is the raw data for the test of the zonal model in Chapter 7.

Facility C.D.S.	Number of Sites	Facility C.D.S.	Number of Sites
14.5	0	13.0	1
13.0	0	15.5	0
16.5	0	15.5	0
16.0	0	14.0	0
13.5	0	07.0	0
18.0	0	14.0	1
15.5	0	06.0	0
08.5	0	14.0	1
20.5	1	14.0	1
09.5	0	12.5	0
21.0	0	14.0	1
24.0	1	12.0	0
07.5	0	12.0	0
09.5	0	06.5	0
13.5	0	18.0	2
10.0	0	11.0	0
14.0	3	14.0	0
08.0	0	10.5	0
13.0	2	13.0	0
18.5	3	08.5	0
16.0	1	08.5	0
21.0	3	09.0	0
08.0	0	09.5	0
16.0	0	11.0	0
08.0	0	13.5	0
08.0	0	04.5	0
08.0	0	13.0	0
08.0	0	12.5	0
08.0	0	17.0	7
08.0	0	04.5	0
11.0	0	21.0	4
13.5	1	11.5	0
14.0	1	15.0	2
13.0	3	14.0	0
11.0	0	17.0	10
12.5	0	15.0	1
12.0	0	09.0	0
19.5	1	12.0	0
11.0	0	12.0	0
12.5	0	08.0	0
18.0	0		

APPENDIX III

Key to Archaeological Site Discussed in

Chapter 6

Listing of Prehistoric Sites Found Near Various Facilities:

Site Number	Site Name or Type	Site Number	Site Name or Type
1-2	Untyped Site	17-30	Ten Mile River Site #2
1-3	Village Site	17-25	Late Archaic, Possible Woodland Village Site
1-9	Heard Farm Site	17-26	River Meadows Site
3-276	Untyped Site	17-27	Untyped Site
3-255	Untyped Site	17-28	Cliff Street Site or Ten Mile River Site #3
6-222	Untyped Site		
6-223	Untyped Site	17-29	Untyped Site
6-267	Untyped Site	17-20	Untyped Site
6-224	Untyped Site	17-22	Untyped Site
6-266	Untyped Site	17-23	Untyped Site
8-266	Shell Lense	17-24	Untyped Site
8-265	Shell Midden	18-66	Manley's Corner Village Site
10-40	Blue Hill River Site	19-8	Late Archaic-Middle Woodland Site
10-33	Peninsula Site	19-50	Untyped Site
10-115	Untyped Site	22-5	Village Site
11-41	Untyped Site	22-38	George Street Site
12-62	Burial Site	22-4	Untyped Site
12-58	Village Site	22-40	Untyped Site
12-59	Village Site	23-20	Untyped Site

Site Number	Site Name or Type	Site Number	Site Name or Type
12-63	Village Site	35-1	Late Archaic Site
13-12	Untyped Site	36-9	Late Archaic-Middle Woodland Site
15-20	Village Site	37-12	Untyped Site
15-21	Village Site	42-1	Woodland Site
15-25	Village Site	42-2	Woodland Site
15-26	Untyped Site	56-P035	Ulcinskas Site - Middle and Late Archaic
17-10	Untyped Site	56-P001	Bancroft I Site-Woodland
23-24	Untyped Site	56-P002	Bancroft II Site-Late Woodland
23-25	Archaic Village Site	56-P003	Bancroft III Site-Woodland
23-30	Untyped Site	56-P006	Wee Willey I Site
23-26	Untyped Site	56-P004	Bancroft VI Site-Woodland
23-22	Untyped Site	56-P005	Bancroft V Site-Archaic
23-23	Untyped Site	63-1	Untyped Site
24-51	Flaggs Field Archaic and Woodland Village Site		
24-60	Untyped Site		
24-63	Untyped Site		
24-72	Untyped Site		
27-186	Untyped Site		
32-20	Untyped Site		
34-7	Untyped Site		

Listing of Historic Sites Found Near Various Facilities:

Key * National Register Site

= Eligible for National Register

+ National Landmark Site

! Massachusetts Landmark

Site Number	Site Name and Construction Date
FD-1	John Welton House 1735
FD-2	Ogreni Dwelling 1855-1859
FD-3	Hull Fire Station 1848
FD-4	Hull Methodist Church 1882
FD-5	Loring Home 1682
FD-6	Hull Public Library 1879
FD-7	*Netascot Home 1675*
FD-8	Hull Coast Guard Station 1889
FD-9	Hull Cemetery 1708
FD-10	Telegraph Hill Water Tower 1903
FD-11	Fort Revere 1776
FD-12 *	Fort Independence 1776-1777
FD-13	Blue Hill Cemetery
FD-14	Job Lane Farm House Mid to Late 1600s
FD-15	18th Century House
FD-16	The House on the Hill Mid to Late 1700s
FD-17	House and Gristmill Site 18th Century
FD-18	Cottonmill and Gristmill Site Ca. 1806
FD-19 *	Fort Rodman

Site Number	Site Name and Construction Date
FD-20	Site of Old Shuttle Shop 18th Century Industrial Center
FD-21 + !	Fruitlands, Bronson Alcott House 1843-1844
FD-22	Charles A. Edgarton and Company 1878
FD-23	Phoenix Hill 1849-1850
FD-24	Shirley Shaker Village Existed 1793-1908 Includes: Shaker Burial Field 1792-1925 Holy Hill Shaker Ice House and Pond Site
FD-25	Area A Includes: Elijah Parmenter House 1803 North Village Cemetery 1807-1969 Area From Which "Fuller's Earth" Was Supplied
FD-26	Ponakin Mill Area Includes: Mill House 1975 Ponakin Iron Bridge 1870 Shoeshank Section of Town 1860-1890 Wooden Road Which Led to Mill Seven Dwellings 1800-1875
FD-27	Brick Traven 1800
FD-28	North Burial Ground 1790-1969
FD-29	Rea McLeod House
FD-30	Dwinell House
FD-31	Cedar Water Pipes Early 18th Century
FD-32 *	Furnace Hill Brook District
FD-33	L. Brown House 1752
FD-34	Gary Bidwell House Mid 19th Century
FD-35	Watkins House 18th Century
FD-36 -	Cheney Silk Mills Landmark District

END

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12-83

DTIC